

The Moon's observed Latitude, 1847-1901. By P. H. Cowell.

In this paper the coefficient of every term in the Moon's latitude greater than $0''\cdot 10$ is obtained from the Greenwich meridian observations between 1847 and 1901. The observed motion of the node is reserved until the observations from 1750 to 1851 have been discussed. One of the largest corrections required by the present tables, however, depends upon Hansen's tabular place of the node.

Tables I., II., III. give the scheme of analysis.

Tables IV., V., VI. give the subject matter of the analysis, and Tables VII. and VIII. the results.

The errors analysed are taken directly from the Greenwich volumes and from vol. 1. of the *Monthly Notices*. They are in the sense tabular minus observed for ecliptic north-polar distance, or observed minus tabular for latitude. They are subject to two important discontinuities: (i.) of tabular place when Newcomb's corrections were introduced into the *Nautical Almanac* at the beginning of 1883, the end of my period 117; (ii.) Stone's refractions were used from 1868 to 1877 inclusive.

The following references to previous papers will save much explanation:

Vol. lxiv. p. 421, the numerical values of the arguments are given.

Vol. lxv. December, a similar paper is given for the longitudes.

As an example, I follow through the third line of Table VII. It is there stated that the argument $F+D$ or $2g-g'+2\omega-\omega'$ has a coefficient $-5''\cdot 41 \sin$ in Hansen's tables, and a coefficient $-5''\cdot 36 \sin$ in Brown's theory. In addition to this the reference number 50 is placed against the term, and two other columns are given which must be understood as meaning that when every error is multiplied by $2 \sin(F+D)$ the mean is $+0''\cdot 17$, and when every error is multiplied by $2 \cos(F+D)$ the mean is $+0''\cdot 40$. In order to understand the details of the arithmetic, the reference number 50 directs the reader to Table I., where it will be seen that the numerical work has been done in two independent ways for this argument, once with the help of an auxiliary angle whose movement in one period of analysis is $400 \times 26^\circ\cdot 311075 + 12^\circ\cdot 156$, or $26^\circ\cdot 3414$ in a lunar day; and a second time with the help of an auxiliary angle whose movement is $26^\circ\cdot 1818$ in a lunar day. These angles are $_{41}A_3$ and $_{55}A_4$, or angles that go through three and four revolutions in forty-one and fifty-five lunar days respectively. In Table VI. columns $41^\circ 3$, $41^\circ 3$, $55^\circ 4$, $55^\circ 4$ give the mean for each period of the errors multiplied by $2 \sin {}_{41}A_3$, $2 \cos {}_{41}A_3$, $2 \sin {}_{55}A_4$, $2 \cos {}_{55}A_4$ respectively. These mean products can be very expeditiously formed owing to the movement of the auxiliary angle in a lunar day being commensurable with 360° . In fact the average time spent

TABLE I.
Scheme of Analysis for Short-period Terms.

Ref. No.	Motion in One Lunar Day.	Excess of Argument over Auxiliary Angle.			Ref. No.	Motion in One Lunar Day.	Excess of Argument over Auxiliary Angle.		
		Middle of Period 44.	Movement in One Period.	Middle of Period 44.			Movement in One Period.	Movement in One Period.	
1	79.497870	74.92	+	6.938	22	41.759026	154.45	+	7.959
1	79.497870	231.00	+	34.440	23	41.079120	25.08	+	129.761
2	77.688100	102.74	-	59.896	24	40.854141	305.91	+	39.769
3	68.124960	301.94	+	6.740	25	40.738880	359.60	-	6.335
3	68.124960	256.32	+	80.172	26	39.949256	60.53	-	20.298
4	67.784720	230.84	-	55.924	26	39.949256	60.53	-	20.298
4	67.784720	143.77	-	16.545	27	39.833995	114.22	-	66.402
5	66.315190	68.08	-	140.591	27	39.833995	114.22	-	66.402
5	66.315190	177.74	+	77.096	28	39.718734	167.91	-	112.506
6	65.974950	152.26	-	59.000	28	39.718734	262.91	+	137.494
7	64.954804	119.39	+	61.922	29	38.929110	111.30	-	137.446
7	64.954804	91.79	+	135.768	29	38.929110	147.74	+	4.076
8	64.165180	348.84	-	48.214	30	38.588870	122.26	-	132.020
8	64.165180	248.27	+	66.072	30	38.588870	68.05	+	6.976
9	63.145034	184.37	-	153.753	31	38.024225	192.74	+	68.048
9	63.145034	246.43	+	21.944	32	37.908964	246.43	+	21.944
10	54.602040	320.70	+	104.966	33	37.799246	113.57	-	21.944
11	54.261800	295.22	-	31.130	33	37.799246	115.49	+	158.658
12	53.472176	53.63	+	55.537	34	37.568724	220.95	-	114.152
13	52.792270	85.17	-	59.564	34	37.568724	222.87	+	66.450
13	52.792270	232.37	+	43.737	35	37.119340	62.11	-	48.816
14	52.452030	206.89	-	92.359	35	37.119340	17.20	+	24.206
14	52.452030	2.70	+	35.359	36	36.888818	308.11	-	13.703
15	52.111790	337.22	-	100.737	36	36.888818	346.07	+	61.649
15	52.111790	38.51	-	24.848	37	36.779100	175.25	-	57.590
16	51.431884	94.88	+	1.325	37	36.779100	213.21	+	17.762
16	51.431884	69.16	+	1.325	38	36.099194	340.07	-	169.017
17	50.642260	285.50	+	6.904	38	36.099194	58.59	+	39.678
17	50.642260	192.74	+	68.048	39	35.758954	33.11	-	96.418
18	50.302020	167.26	-	68.048	40	29.365970	131.79	-	8.714
18	50.302020	189.82	-	39.192	40	29.365970	346.93	+	70.712
19	49.622114	211.53	-	13.223	41	29.025730	321.45	-	65.384
20	48.492250	308.55	-	62.560	41	29.025730	253.54	+	90.292
21	42.548650	46.53	+	78.282	42	28.236106	21.42	+	44.442
22	41.759026	19.31	-	127.560	42	28.236106	198.50	+	73.662

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Ref. No.	Motion in One Lunar Day	Excess of Argument over Auxiliary Angle.			Ref. No.	Motion in One Lunar Day	Excess of Argument over Auxiliary Angle.		
		Middle of Period 44.	Movement in One Period.	44.			44.	Middle of Period	Movement in One Period.
43	28.120845	75.11	-	1.662	63	16.522956	136.85	+	63.728
43	28.120845	252.19	+	27.558	64	15.843050	260.71	-	15.722
44	27.556200	357.76	-	54.443	64	15.843050	298.00	+	76.351
44	27.556200	89.46	+	154.555	65	15.502810	235.23	-	151.818
45	27.446482	224.90	-	98.330	65	15.502810	272.52	-	59.745
45	27.446482	316.60	+	110.668	66	14.713186	275.83	+	7.723
46	27.331221	278.59	-	144.434	67	14.597925	329.52	-	38.381
46	27.331221	10.29	+	64.564	68	14.372946	250.35	-	128.373
47	27.215960	63.98	+	18.459	68	14.372946	352.21	+	138.788
48	26.875720	38.50	-	117.637	69	14.033280	39.03	+	2.922
48	26.875720	153.47	+	83.621	70	13.693040	128.36	+	43.254
49	26.426336	252.52	-	17.702	71	13.583322	355.50	-	0.634
49	26.426336	326.13	+	33.949	71	13.583322	52.98	+	99.996
50	26.311075	19.82	-	12.156	72	13.352800	102.88	-	92.842
50	26.311075	277.72	+	51.704	72	13.352800	160.36	+	7.787
51	26.195814	73.51	-	58.260	73	12.788155	192.74	+	68.048
51	26.195814	331.41	+	5.599	74	12.672894	246.43	+	21.944
52	26.086096	198.55	-	38.288	75	12.563176	113.57	-	21.944
52	26.086096	49.20	-	0.344	76	12.447915	167.26	-	68.048
53	25.406190	88.05	-	123.238	77	12.332654	220.95	-	114.152
53	25.406190	192.74	+	68.048	78	11.883270	126.53	+	108.147
54	25.175668	300.12	-	24.161	79	11.543030	101.05	-	27.949
54	25.175668	131.59	+	139.233	79	11.543030	301.37	+	117.212
55	25.065950	167.26	-	68.048	80	10.638145	238.25	+	19.964
55	25.065950	358.73	+	95.346	80	10.638145	23.11	+	81.345
56	24.386044	20.07	-	176.617	81	10.522884	291.94	-	26.141
56	24.386044	20.48	+	154.418	81	10.522884	76.80	+	35.241
57	24.276326	247.62	+	110.530	82	9.733260	353.55	+	1.412
58	24.161065	301.31	+	64.426	82	9.733260	109.74	+	153.044
59	24.045804	355.00	+	18.322	83	9.502738	100.93	-	90.797
60	23.365898	63.40	-	4.291	83	9.502738	217.12	+	60.835
60	23.365898	167.69	+	56.037					
61	23.256180	290.54	-	48.178	97	27.161150	97.05	-	3.465
61	23.256180	34.83	+	12.150	98	13.747850	326.93	+	21.924
62	22.236034	71.34	-	105.586	99	13.638230	33.07	-	21.924
62	22.236034	130.12	+	78.087	100	11.597841	67.98	-	6.025
63	16.522956	247.31	-	140.818					

TABLE II.

Scheme of Analysis for Terms of Period comparable with One Year.

Ref. No.	Motion in 40 Lunar Days.		Value at Middle of Period 44.	
	In Degrees.	In Units.	In Degrees.	In Units.
84	160°80728	4.020182 ÷ 4	316°68	7.9170 ÷ 4
85	120.00144	1.000012	312°54	2.6045
86	92.80520	1.031169	333°88	3.7098
87	88.41648	1. - 0.017595	201°02	2.2336
88	79.19560	2 - 0.020110 ÷ 2	308°40	7.7100 ÷ 2
89	65.58600	1.093100	282°92	4.7153
90	47.61064	1.058014	196°88	4.3751
91	43.00020	1 - 0.044440	250°57	5.5682
92	38.38976	1 - 0.040256	304°26	7.6065
93	34.00104	1.038921	171°40	5.2372

TABLE III.

Scheme of Analysis for Terms of Period comparable with Ten Years.

Ref. No.	Motion in 200 Lunar Days.		Value at Middle of Period 44.	
	In Degrees.	In Units.	In Degrees.	In Units.
94	34°0240	1.03962	192°74	5.8893
95	12.0804	1.00670	59°88	4.9900
96	10.9718	1.00575	246°43	22.5894
101	23.0620	1.02498	225°82	10.0364

on each number in Table VI. from the very beginning is something less than ten minutes for one computer. Lastly, to obtain the product of each error by $2 \sin (F+D)$ we have from Table I. for the p th period

$$\begin{aligned} \sin (F+D) = & \sin_{41} A_3 \cos \{19^\circ 82 - 12^\circ 156(p-44)\} \\ & + \cos_{41} A_3 \sin \{19^\circ 82 - 12^\circ 156(p-44)\} \end{aligned}$$

In this way the result set down in the third line of Table VII. was found.

To interpret this result it is necessary to look at the two adjacent lines, the second and the fourth. The former can be at once dismissed from notice. The latter is of great importance as affecting the result. If we ignore the fourth line it would seem as if the tabular coefficient $-5^\circ 41$ required a correction $+0'' 17$, and a very large correction to its epoch. The terms $-0'' 27 \sin F - 0'' 72 \cos F$, however (on a principle that I have now often explained, and which lies at the root of the extremely discordant values that have been given from time to time for the

TABLE IV.

Mean Error, in Tents of a Second of Arc, of Moon's Latitude (Observed minus Tabular) for each Column of Forty Lunar Days.

No. of Column.	1	2	3	4	5	6	7	8	9	10
850+	+ 2	+ 5	+ 9	+ 12	+ 12	+ 16	+ 2	- 3	- 2	+ 10
860	+ 3	+ 14	+ 22	+ 4	+ 12	- 1	- 7	- 3	+ 3	+ 5
870	- 5	+ 17	+ 18	+ 15	+ 13	+ 11	0	0	- 2	+ 12
880	+ 8	+ 5	- 9	+ 4	+ 10	- 4	+ 3	+ 2	+ 2	- 1
890	+ 1	- 3	- 7	- 6	- 2	+ 7	+ 5	- 16	+ 2	+ 5
900	- 5	- 5	- 1	- 1	+ 7	+ 8	- 6	+ 6	- 1	+ 3
910	- 2	+ 7	+ 1	+ 7	- 2	- 2	- 5	+ 2	- 2	+ 3
920	+ 1	+ 5	- 10	+ 9	0	+ 3	+ 5	- 7	- 3	+ 3
930	+ 5	+ 4	+ 3	- 5	0	+ 2	+ 3	- 2	+ 2	- 10
940	0	- 3	- 1	+ 2	- 5	- 6	+ 6	- 6	0	+ 2
950	- 1	- 9	- 9	- 3	- 6	+ 3	+ 7	0	- 10	+ 3
960	- 12	- 3	- 4	+ 3	- 4	+ 10	- 10	+ 5	+ 2	- 7
970	- 7	- 3	+ 1	+ 6	+ 2	+ 4	+ 19	+ 3	0	+ 7
980	+ 3	+ 10	- 1	- 2	+ 1	- 2	- 6	- 7	0	+ 1
990	+ 5	+ 1	0	0	- 7	- 7	- 6	+ 1	0	- 1
1000	0	- 3	- 1	- 5	- 8	- 2	- 5	+ 2	- 10	- 1
1010	- 8	- 3	- 9	+ 1	- 9	0	- 3	+ 6	0	- 3
1020	+ 3	+ 4	+ 3	+ 5	+ 2	0	- 2	+ 4	0	+ 11
1030	+ 4	0	+ 7	+ 11	+ 9	- 2	+ 4	+ 15	+ 14	+ 10
1040	+ 13	+ 13	+ 16	+ 7	- 4	+ 12	+ 22	+ 7	+ 10	+ 15
1050	+ 9	+ 10	+ 9	+ 3	+ 6	+ 15	+ 12	+ 11	+ 7	+ 8
1060	+ 5	+ 14	+ 10	+ 13	+ 11	+ 17	+ 10	+ 2	+ 7	+ 8
1070	+ 7	+ 9	+ 17	+ 14	+ 18	+ 1	+ 10	+ 2	+ 4	- 5
1080	+ 6	+ 24	+ 30	+ 5	+ 7	+ 2	+ 1	+ 1	+ 14	+ 11
1090	+ 26	+ 20	+ 2	+ 22	- 7	0	- 5	+ 7	+ 7	+ 12
1100	+ 18	+ 11	+ 4	+ 5	- 8	+ 1	+ 1	+ 23	+ 19	+ 10
1110	+ 12	+ 13	+ 13	+ 6	+ 14	+ 24	+ 23	+ 11	+ 22	+ 4
1120	+ 7	+ 4	+ 3	+ 4	+ 10	+ 19	+ 12	- 7	+ 10	- 3
1130	+ 4	+ 3	[+ 20]	+ 19	+ 19	+ 6	- 6	- 7	- 11	+ 7
1140	+ 9	+ 7	+ 13	+ 19	7	- 2	- 27	+ 3	+ 3	+ 10
1150	+ 12	+ 2	16	- 11	- 20	- 27	- 3	+ 12	+ 1	- 6
1160	- 22	- 16	- 22	- 16	- 3	+ 5	+ 8	- 6	+ 4	- 11
1170	- 3	- 10	- 4	- 8	- 2	- 13	+ 7	- 9	- 8	- 14
1180	- 3	- 14	- 1	- 8	- 11	- 4	- 4	+ 2	0	- 5
1190	+ 10	- 2	- 4	- 10	+ 6	- 11	- 5	+ 2	+ 1	0
1200	- 7	- 5	- 4	- 5	- 8	- 9	- 6	- 1	+ 5	+ 2
1210	- 6	- 13	- 2	- 16	- 2	- 18	- 10	- 2	0	- 8
1220	- 3	- 11	- 5	- 3	- 8	- 4	+ 3	- 1	+ 10	+ 2
1230	- 4	- 9	- 3	- 9	- 7	- 10	- 7	+ 1	- 7	+ 7
1240	0	- 4	+ 3	[0]	- 14	- 2	- 2	- 7	+ 10	+ 12
1250	+ 1	- 3	- 3	- 1	- 10	- 8	0	- 2	- 2	+ 5
1260	0	- 11	- 12	- 14	- 2	- 8	- 3	+ 1	- 10	+ 6
1270	- 14	+ 1	- 14	- 7	+ 1	+ 2	- 3	- 8	- 9	0
1280	0	+ 4	+ 6	+ 8	- 1	0	- 4	- 11	+ 3	+ 5
1290	+ 9	+ 11	+ 14	+ 10	- 8	- 3	- 10	0	+ 12	+ 6
1300	+ 10	+ 2	+ 1	- 3	- 3	- 5	+ 4	- 4	+ 8	- 3
1310	+ 11	- 5	- 1	- 3	+ 1	- 9	+ 8	+ 4	- 4	- 12
1320	- 2	- 5	- 1	- 1	+ 6	- 4	+ 2	- 6	- 3	- 8

TABLE V.

Mean Error, in Fiftieths of a Second of Arc, of Moon's Latitude (Observed minus Tabular) for each Half-period of 200 Lunar Days.

	A.	B.	C.	D.	E.	F.
1	+ 40	+ 7	- 28	+ 63	- 27	- 16
2	+ 23	- 5	0	+ 21	- 37	- 7
3	+ 55	- 7	+ 17	+ 30	- 37	- 39
4	- 3	- 4	+ 13	+ 54	- 11	- 14
5	+ 58	- 28	+ 31	+ 58	0	- 33
6	+ 21	+ 3	+ 41	+ 84	- 13	- 18
7	+ 18	- 20	+ 45	+ 28	- 29	+ 17
8	+ 2	0	+ 66	+ 31	- 9	- 7
9	- 17	- 1	+ 37	+ 65	- 39	+ 36
10	+ 3	+ 33	+ 53	- 11	- 38	+ 5
11	- 5	+ 11	+ 53	+ 41	- 30	+ 7
12	+ 10	- 14	+ 44	- 13	+ 10	0
13	+ 11	- 1	+ 65	- 33	- 32	+ 3
14	- 4	- 13	+ 12	- 23	- 16	- 13
15	+ 5	- 17	+ 72	- 79	- 15	- 3
16	+ 1	- 16	+ 29	0	+ 11	- 19

principal elliptic coefficient), would naturally give rise to apparent terms $+0''\cdot13 \sin(F+D) + 0''\cdot35 \cos(F+D)$. The excess of the results set down in the third line, viz. $+0''\cdot04 \sin(F+D) + 0''\cdot05 \cos(F+D)$ need alone be considered. The former term makes the observed coefficient $-5''\cdot37$ (the agreement with Dr. Brown's coefficient being here a little closer than usual), and the cosine term may be dismissed as accidental.

In the column "concluded coefficient" I set down the observed coefficient to $0''\cdot1$. I consider the probable error as $\pm 0''\cdot03$, the actual error seldom exceeding $0''\cdot1$. As the theoretical coefficients have already attained a higher degree of accuracy, my Table VII. must be merely looked upon as a verification, with a determination of the principal coefficient in latitude. Table VI. may be similarly looked upon as a proof that the planetary inequalities in latitude are not large, and as a means of quickly verifying to within $0''\cdot1$ any inequality that may be subsequently calculated. From Table VI. I infer that there is probably no further inequality with coefficient exceeding $0''\cdot5$ excepting pairs with equal coefficients and arguments $A \pm F$, where A is an angle of very long period.

A few columns at the end of Table VI. require explanation.

The mean product of every error by $2 \cos D$ has already been set down for each period in the middle of Table VI. As $\cos D$ is negative for the majority of observations, the value set down in this column will naturally follow (with opposite sign) any

TABLE VI.

Mean Value, in Tenth of a Second of Arc, for each Period of Analysis of Errors of Moon's Latitude (Observed minus Tabular), each multiplied by certain Factors.

Period.	77°17.	77°17.	68°15.	68°15.	37°8.	37°8.	37°7.	37°7.	53°10.	53°10.	69°13.	69°13.
86	+1	+2	+1	-2	-4	+2	-1	+1	-1	+1	0	+1
87	-4	+6	+6	+3	-1	-1	0	-1	-1	+1	0	-1
88	-3	-1	-2	+2	0	+2	+4	-2	+1	-3	-2	+1
89	+2	-1	+1	-3	+2	+1	0	-1	+1	-1	-1	0
90	+2	-2	+2	-3	-1	+1	+1	-1	+2	+1	+2	-1
91	0	-1	+1	-1	0	-2	-3	+1	+3	-1	+2	-2
92	-1	+4	-3	+3	+1	-3	-1	-2	-2	+2	-2	+2
93	+1	-1	+2	+1	+2	+2	0	+5	+2	+3	-2	+3
94	+5	+1	-1	+5	-2	+5	+2	+2	0	+1	0	0
95	-2	0	+1	-1	+1	+1	+2	-1	0	+1	0	0
96	+3	-1	-1	+1	+1	+1	-1	-5	+2	+5	-3	-4
97	-1	+1	+1	-1	0	-1	-1	+1	0	+1	+1	0
98	+2	-1	-2	0	-4	-2	+3	0	0	-1	+1	0
99	-1	-1	0	+1	+4	-1	+3	-1	+2	0	-1	-1
100	+1	-2	-3	0	0	0	-2	+4	-4	-4	-7	-1
101	0	-1	-2	0	-1	-1	-1	-2	0	+2	-1	+2
102	+2	0	0	-1	-1	-5	-3	+1	+1	+1	+1	0
103	-2	-2	-3	0	+5	+3	-3	+1	0	+2	-1	+1
104	+2	+1	+2	+1	+2	0	-5	-1	-2	-3	+3	0
105	-5	0	-5	-2	-4	+1	-2	-5	+6	0	-5	+3
106	-4	+3	-4	-2	+2	-2	+1	+1	0	-2	-2	+1
107	-5	+3	-3	-5	+1	-2	-6	+1	0	+5	+5	-1
108	+3	-6	+4	+5	-2	-2	-2	+3	0	+3	+3	-1
109	+6	-4	-2	+6	+4	+2	-6	0	-2	-4	-3	-3
110	+3	-1	-3	+1	+1	-3	0	+2	-3	+1	-3	+2
111	+2	+1	-1	-2	+1	+1	+1	0	-2	-1	-1	-2
112	-3	+3	+4	0	-6	-1	-1	+6	+5	-1	+3	+4
113	+1	-3	-4	-1	+3	-1	-3	-1	-3	0	+1	-2
114	-1	-5	-4	-1	-5	-2	-9	+1	-5	-7	+6	+3
115	+3	+1	+2	-2	0	+1	-1	0	0	-1	0	+1
116	0	+1	0	0	0	+1	+1	0	-1	0	0	-1
117	+1	-2	+1	-2	+1	-4	-3	-1	-1	+5	+6	0
118	+5	-1	+4	+1	-2	-2	-3	0	-2	+1	-1	+2
119	+2	+1	0	+2	+2	-1	+1	0	-1	+1	-1	+3
120	0	+1	-1	0	+2	0	-2	+2	-1	-3	+1	-3
121	-2	+1	-1	-2	-1	-6	+1	+1	-1	-1	0	-1
122	0	+4	-2	-3	+3	+2	-1	+2	+2	0	-1	+3
123	0	+2	0	-2	-6	+2	+1	-1	+2	+1	-3	0
124	+4	0	-4	-2	+1	0	-1	+1	-1	0	+1	-1
125	+1	+4	+3	-3	+3	+3	-2	-2	+2	0	-1	-2
126	+2	+1	0	-3	-1	-1	-2	+1	+2	+1	+2	-2
127	-2	+1	+1	+2	+4	+1	-1	0	-1	+1	0	+1
128	-2	-1	-3	+2	+1	0	-1	0	-2	+1	-1	+2
129	+1	-2	+1	-2	+2	-1	+1	-3	+4	-1	+5	0
130	+1	0	0	0	+1	0	+4	-1	-3	+2	-2	-3
131	-1	0	-1	0	+3	-1	+1	-1	0	0	0	0
132	-2	-2	0	-3	0	0	-1	+1	+1	+1	-1	0
133	0	0	0	0	0	-3	0	-1	+1	-2	-1	+2

Period.	27 ^o 5.	27 ^o 5.	49 ^o 9.	49 ^o 9.	50 ^o 9.	50 ^o 9.	39 ^o 7.	39 ^o 7.	28 ^o 5.	28 ^o 5.	45 ^o 8.	45 ^o 8.
86	+3	+5	-I	-7	+2	-2	-3	+2	+I	-I	0	+2
87	+4	+5	-3	+I	-3	+I	+3	+3	+2	-3	+3	+3
88	+I	0	+3	-2	-4	0	-7	+2	-7	-6	-5	+6
89	+5	-I	-2	+4	+5	-4	+6	+2	-5	-I	-5	+1
90	-I	-3	+2	-4	+3	+3	-3	+I	0	0	+1	+2
91	-5	-2	+3	+3	-3	-I	+3	+3	-3	+2	+3	+2
92	+3	0	-I	+3	-3	0	-I	+2	+2	+I	+3	0
93	+3	+3	+4	+3	+3	0	+3	-I	+3	-2	+1	+2
94	-3	-3	-3	+I	-3	+2	-I	-2	0	+2	+2	-1
95	0	+2	-4	+I	0	0	0	+I	+2	-I	+3	-3
96	-2	+I	+2	+I	+I	+I	+I	-I	+I	0	0	-I
97	+2	+2	0	0	+I	0	0	-2	+2	+I	-2	-I
98	+I	-2	0	+4	+4	+3	+2	+4	+2	+4	+3	+3
99	-2	+2	+I	+I	+2	-I	+2	+2	0	+3	0	0
100	0	0	I	+I	+I	+I	-I	0	0	0	-I	0
101	+2	0	+I	-2	+I	+2	+I	-2	0	-I	0	-I
102	-2	-3	0	0	-I	+2	0	+I	0	-2	+2	-I
103	+4	-2	0	-3	-I	0	-2	0	+I	+2	0	-I
104	0	-I	+I	-2	-I	0	0	0	+I	+2	+4	-I
105	-5	+I	-I	0	-3	+5	+I	-5	+I	+2	-I	0
106	-5	-I	0	+2	-3	-I	0	+3	0	+2	+I	-5
107	-I	0	+2	+7	-I	+4	+3	+3	0	+2	+I	0
108	0	+6	+I	+3	+I	-4	0	-3	+3	-I	+3	-2
109	0	-4	0	-3	-I	-5	+4	-2	-2	0	+2	-2
110	+3	0	+2	+2	-2	-I	+2	-I	+I	0	-I	-0
111	-I	+2	+I	0	-2	+I	+2	+3	-I	-4	-I	-2
112	-2	-I	0	+I	+2	-5	+I	-5	+I	-6	+5	+4
113	-I	+5	+3	+3	+2	-I	+4	0	-2	+5	+4	-I
114	+I	0	+I	0	0	-3	+4	-2	-I	-I	+3	-2
115	+5	+2	0	+4	+I	-4	0	+3	-2	+4	-3	-3
116	-I	+3	+5	+3	-8	-3	-2	+10	-3	-10	-2	+9
117	+2	-I	+2	-2	0	+I	+2	+I	0	-4	-3	-2
118	-5	-I	-2	-I	-2	+I	-3	+I	-2	-I	+I	-2
119	0	+4	0	+I	0	+4	-4	-2	+4	+I	-2	0
120	-3	+I	+I	-2	+I	+I	-2	-I	-2	+2	+3	+3
121	-2	+2	+I	+I	+3	0	-I	-3	+3	0	+2	+3
122	-2	-2	+I	+I	-2	+2	-2	+3	+3	+I	-2	-2
123	+2	-2	+2	-I	-I	-2	+I	-I	+2	0	+I	-2
124	+4	+2	+2	-4	+2	+I	-3	0	+3	-3	+4	+1
125	-3	+I	0	0	0	0	-I	+I	+2	+I	-3	-I
126	-I	0	+I	0	-2	-I	-I	+2	-I	+3	+2	+I
127	-2	+I	+I	+2	-I	-I	-2	-I	+3	0	+2	+I
128	+2	0	+I	+2	-2	+I	-I	-2	-I	-2	+3	+4
129	+I	+3	+2	+I	-5	0	+2	-4	+2	-I	-2	+I
130	-I	-I	+3	+I	0	+2	-I	-2	+I	+2	-I	+1
131	+2	+2	0	-I	+I	+I	+I	0	+2	-I	0	+2
132	0	+2	-3	-I	-2	+2	-I	+3	-3	-I	+I	+2
133	+I	+2	0	+2	0	-I	0	0	0	-I	-I	-2

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Period.	68°12.	68°12.	sin 5D.	cos 5D.	53°8.	53°8.	27°4.	27°4.	68°10.	68°10.	41°6.	41°6.
86	+5	+3	+I	-6	+I	-7	+2	+I	0	+2	-2	-I
87	-2	+4	-3	0	+I	-2	+5	-2	0	-3	-2	+I
88	-3	+3	0	+3	0	-4	+6	-3	+2	+2	+I	0
89	+I	-5	+2	-4	-I	+2	+4	+2	-4	-2	+I	-5
90	+3	+2	-I	-3	0	-5	0	-2	+I	-3	-3	+2
91	0	-I	+3	0	-2	+2	0	-2	0	+2	+I	+3
92	+2	0	-I	-I	-I	+I	+I	+2	0	0	0	-I
93	0	+I	0	+I	-I	0	-I	0	0	-I	0	+I
94	+2	+2	+I	-3	+I	-I	-I	0	-2	-3	-4	+2
95	-4	+3	-2	0	+2	+2	-I	-4	+3	-I	+2	0
96	+4	-6	-4	+6	+I	+2	+3	+I	+I	-5	+3	+2
97	+2	-I	+2	-2	0	+3	+I	+4	0	0	-I	+2
98	+I	+I	-2	+2	0	+2	0	+I	0	+I	+I	-I
99	-3	0	-2	+2	0	-5	-3	-4	-5	-3	0	-3
100	0	-I	0	+I	-I	-3	-I	+3	-I	-2	+I	+2
101	0	-I	+2	-I	-I	-3	+I	-I	-I	-2	-2	+2
102	+2	-I	-2	+3	+4	-2	+4	+4	-3	+2	-I	0
103	-2	-2	-I	-I	+I	-2	-2	+I	+2	+2	-2	+I
104	+I	+3	-I	0	-I	+I	-2	-2	0	-2	0	+2
105	-3	0	-3	-I	+3	+I	0	-6	+I	+2	+2	-2
106	+6	+5	-4	-2	-4	-I	+I	-2	+I	-3	+4	-I
107	0	+3	+I	+4	+3	0	-2	-2	-I	0	+3	+I
108	+3	+I	-3	+2	+2	+I	-I	-2	-I	+I	+4	+2
109	-4	+I	-3	+3	+I	-5	-5	-I	+7	+I	+5	+6
110	-2	-I	+2	0	-2	-2	+I	-I	+2	-2	0	+5
111	+I	+2	+2	-2	+I	-I	+5	+3	+I	+6	+I	-5
112	-6	0	+I	-5	0	0	-I	+2	-I	+I	-I	+2
113	+I	0	0	+I	-3	+2	+2	-3	+2	-4	+4	0
114	-7	+4	0	-4	-2	-I	-I	-I	-I	+2	+I	-2
115	0	-4	-I	-5	-I	0	-2	+4	-3	+2	0	+3
116	-2	-6	+5	-2	+3	0	0	-2	+7	+4	+6	+9
117	0	0	+2	-2	-4	+2	-3	+4	+2	+4	-2	0
118	-I	+I	-2	-I	-2	-I	-2	-2	+2	-3	-2	-I
119	0	+I	+I	-I	-I	+I	+3	0	+2	-4	-2	-4
120	-3	-4	+I	-2	0	-I	+I	+I	-2	-I	+2	-3
121	0	+4	+4	0	+I	+3	0	+4	+3	-4	-2	+3
122	-2	+I	0	-2	+I	+3	-I	-I	0	+I	+2	-I
123	+3	-3	-2	-3	+2	-2	+2	-2	+2	+2	+3	+3
124	0	0	-2	+I	0	+3	-3	+4	+I	+2	0	0
125	0	-I	+I	0	-3	+I	+2	+I	0	-I	-3	-I
126	+I	0	0	+2	+I	+2	+I	-I	0	-I	+2	0
127	0	0	0	0	-I	-2	-I	-5	+3	+I	-2	+I
128	+7	-2	+3	+3	+3	-3	+3	+I	0	-3	-2	+2
129	-2	-2	-2	+I	+5	-2	0	+2	+I	+4	+3	0
130	-I	+3	-4	+I	+2	-I	+I	-I	-4	+3	-6	0
131	0	+I	0	-2	+2	-I	+3	-3	+I	-I	-I	0
132	+2	+I	0	+2	0	-I	0	-2	-I	+I	+I	+2
133	+I	0	0	+I	-2	0	0	+2	+I	+I	+I	0

Period.	55°8.	55°8.	69°10.	69°10.	28°4.	28°4.	49°7.	49°7.	64°9.	64°9.	sin 4D.	cos 4D.
86	+2	-2	+2	-1	+3	0	+2	-1	+2	-1	0	-2
87	+1	-2	+4	+1	-2	-4	-4	-3	0	-4	+2	-3
88	+1	-1	-2	+1	+3	+3	+4	+2	+5	+1	-1	+4
89	+4	+3	-2	-5	+6	-4	+4	-6	+2	-3	+1	+2
90	+2	+2	+2	-1	+1	-3	-1	-3	0	+1	0	-1
91	-1	+2	-1	0	-1	-3	-2	-2	+1	-1	-1	-1
92	0	+3	-3	0	0	-1	-1	-1	0	-2	-2	-2
93	-2	0	+3	0	-1	-3	-2	-2	0	-3	+2	-3
94	-3	-3	-2	+3	-1	+2	0	+2	0	+1	-1	0
95	-2	-1	-2	-1	+2	+1	+2	0	-1	+1	+1	-1
96	+2	-1	+1	0	+1	0	+1	0	-3	+1	+3	0
97	-2	-1	+2	-1	+2	0	+2	-1	+3	+3	+3	-4
98	-4	+1	+5	+1	+1	+2	+2	+2	-1	+4	0	+3
99	-1	+1	+2	+1	+2	0	+2	-1	+2	-1	+1	-1
100	-2	0	-2	0	+3	-1	+2	-3	-1	-1	+1	-1
101	+4	0	+2	+3	-1	-1	-1	-1	-1	+1	0	-1
102	+2	-1	-1	+3	0	-2	-1	-1	0	+2	+1	-2
103	0	-3	-1	+2	0	+2	+1	+2	+1	0	0	-1
104	+2	-1	0	-2	+1	-1	+1	-1	-4	-1	-4	+1
105	+2	-2	0	-1	+3	+1	+3	-1	0	-3	+2	-3
106	-2	+4	-4	-2	0	+1	0	+1	+1	-2	+1	+2
107	+3	-4	-1	+4	+1	-1	+1	-1	0	0	+1	0
108	+2	+5	+2	-5	-4	-4	-5	-2	+1	0	-1	-1
109	-2	-6	-4	-2	+2	+3	+3	+2	-3	-2	-3	+2
110	+4	+1	+3	+2	-5	-1	-5	+2	-3	0	-2	+1
111	+3	-2	+2	+1	+2	+1	+2	0	-5	+3	-5	+1
112	+2	-1	-2	+1	-4	+1	-3	+4	+9	+4	-6	+8
113	+1	-3	-3	0	-3	+2	-1	+3	-2	-3	+3	+2
114	+2	-2	+1	-5	+4	-1	+3	-2	-6	0	+4	+4
115	+2	-1	+1	+1	-5	0	-5	+3	-2	-4	-4	0
116	+7	+10	-11	-1	-2	+7	+1	+7	-3	+1	-3	+1
117	+1	0	0	-1	-1	0	-1	+1	-4	0	-3	-1
118	-2	+2	0	+4	+1	-2	0	-2	+2	+2	-2	0
119	-2	-4	-4	-3	0	-2	0	-2	+2	+1	-2	-1
120	-1	+3	-2	0	+3	+4	+4	+2	+2	-2	-3	-1
121	+1	+1	0	0	0	-2	0	-2	+1	-2	-2	-3
122	+3	0	-2	-1	+2	-2	+1	-3	-1	-2	-1	-3
123	-6	0	-2	+5	-5	+2	-4	+3	-1	-4	+2	-3
124	-1	0	-2	0	0	-3	-1	-3	0	-2	+2	0
125	0	-5	+5	0	-1	0	-1	+1	+1	+1	-1	-2
126	-3	-1	+3	+1	-1	-1	-1	0	-1	-2	-1	+2
127	-3	+1	+1	+2	-1	+2	0	+2	+2	-1	0	-2
128	0	-3	-2	-4	-1	-2	-2	-1	-2	-1	-2	-1
129	-1	0	0	+1	0	+2	+1	+1	+2	-4	+3	0
130	-4	+2	-2	-2	-2	-3	-3	-2	0	-1	+1	+1
131	+2	0	-2	0	-1	-2	-2	-1	0	-1	+1	+2
132	+1	-1	0	0	0	+1	0	+1	+1	0	0	-1
133	0	-1	-2	-1	+1	0	+1	-1	0	+1	0	+1

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Period.	50°7.	50°7.	29°4.	29°4.	37°5.	37°5.	68°8.	68°8.	77°9.	77°9.	69°8.	69°8.
86	+2	+2	-3	0	+3	-5	+7	-4	+6	-2	+4	+6
87	-2	+4	+5	0	-1	-5	0	+2	-4	-1	+4	+3
88	+2	-3	-1	-5	+4	+3	+1	-2	-1	+1	-2	0
89	0	-1	-1	-6	-1	+1	+2	+2	+3	+1	-2	+1
90	-2	0	-1	+2	-4	+2	+1	+3	-4	+2	+6	+2
91	-2	0	-1	0	0	0	0	-2	-1	+3	0	+1
92	-3	-1	+1	+2	-1	+3	0	+3	+1	+3	-1	-2
93	+1	-3	+1	+2	0	+1	0	-3	+2	+1	+3	0
94	-1	-1	-1	0	+1	0	0	+5	+2	-4	+1	+2
95	+2	-1	-1	+2	+2	+6	-1	-1	-3	-3	0	+5
96	0	+3	-1	-2	+1	-1	-1	-1	0	-1	-2	+1
97	+2	+4	+2	0	+1	-3	-4	+2	-1	-2	0	-4
98	-3	0	-1	-1	-2	-1	0	-1	0	+1	+1	-2
99	0	+2	-5	-4	-3	0	+2	0	+5	0	+5	0
100	-1	0	-1	0	+3	0	-1	+3	-2	-3	+2	+1
101	0	+1	0	0	-1	+2	-1	-1	+1	+1	+2	-2
102	-2	0	+1	-1	-3	-1	-1	0	-1	+1	0	-1
103	-1	0	-1	+3	+1	0	+2	0	0	+4	+3	-2
104	-2	+3	+1	+3	+1	-2	-2	0	+1	0	+2	+1
105	+2	-4	-1	+3	+2	0	-3	+2	+4	+5	-5	+4
106	-1	+3	+1	-4	+1	+1	+3	-1	+2	0	-2	-1
107	+1	+1	+2	+1	-1	-2	+2	+3	-3	-3	-1	0
108	+1	-1	+1	+4	+1	0	-2	-1	-3	+1	+2	0
109	-3	-4	0	+1	-3	-2	+5	-1	+4	-1	-2	-4
110	0	-1	+5	0	+3	+6	+2	-4	+1	+3	0	+1
111	+3	-3	+3	-1	+3	-1	-4	-2	0	+5	+2	-3
112	+6	-6	+1	0	+3	-2	+4	0	+8	+1	+9	-2
113	-2	-3	0	+1	+3	0	-4	+1	+3	-2	-2	+3
114	0	-5	-4	+5	0	+8	+6	0	-4	-5	-3	+3
115	0	+3	0	-2	-3	-4	-1	0	-2	0	-1	-2
116	0	+2	-1	0	0	+3	+2	0	+1	+1	-1	-1
117	-3	0	-3	0	+3	+1	+1	-2	0	+2	+1	0
118	-3	-1	+4	+1	+1	+2	+1	-4	-3	-2	+1	-2
119	-1	-1	+1	0	-3	+2	0	-4	+2	-4	-4	+4
120	-1	-2	-2	+2	0	+1	+2	+1	-6	0	-6	+1
121	+2	-3	-1	0	-1	0	-1	-3	-5	+1	+2	-3
122	+4	0	0	-1	0	-2	-1	+2	-2	+4	+4	0
123	+1	+2	+1	+1	-2	+4	0	0	0	+2	-3	0
124	-2	-1	+5	-2	-1	-1	+1	+2	+2	-1	-1	0
125	-1	+3	-5	+3	+5	0	0	+1	-1	+1	0	+1
126	+2	0	+2	-1	-1	+1	-2	-3	+3	-1	+1	+2
127	-2	+1	+4	0	-1	0	+1	+2	-1	-2	+2	+2
128	-1	+1	0	-1	+1	+3	-4	-5	-6	-3	-3	-2
129	+1	-2	+1	-3	+1	+1	+2	+1	-2	+4	-2	-4
130	+2	0	+2	-1	+1	-1	-1	+1	+2	0	0	-1
131	0	+2	-1	+2	-1	-1	+3	-2	+1	-3	+2	+1
132	+1	0	+4	-1	+1	-2	+1	+2	-1	+2	+1	0
133	0	0	0	-1	+1	+2	0	0	-1	0	-1	+1

Period.	53°6. +5	53°6. 0	27°3. - I	27°3. +4	45°5. - I	45°5. +4	64°7. -2	64°7. -5	55°6. -2	55°6. +4	37°4. - I	37°4. 0
86												
87	0	- I	0	+2	0	+2	-4	+1	0	+4	0	+1
88	-2	- I	0	-2	0	-2	-6	-3	-6	+1	+3	0
89	-2	+ I	+ 4	-2	+ 4	-2	-4	+5	-4	+4	+2	+4
90	+2	- 4	- 3	0	- 3	0	0	-4	+2	-3	+2	+1
91	+4	- 4	0	+2	0	+2	+3	+3	-2	+3	+2	0
92	-2	+ 4	0	+2	0	+2	+3	+2	-3	+1	- I	-2
93	-3	+ I	+ 3	- I	+ 3	- I	+ I	0	- I	+2	-3	- I
94	-2	- 6	+ 2	-2	+ 2	-2	+2	0	- I	- I	- I	0
95	+2	- 4	+ 3	-2	+ 3	-2	-2	- I	- I	+ I	0	- I
96	+3	- 3	- 4	-2	- 4	-2	+3	- I	+ I	-2	0	- I
97	0	+ 4	- 5	+2	- 5	+2	0	0	0	- I	-2	-2
98	0	+ 3	- 5	+2	- 5	+2	0	+ I	- I	- I	+4	+ I
99	-3	+ 2	- 3	- I	- 3	- I	+ I	+ I	- I	+ I	- I	+3
100	- I	+ 2	- 5	0	- 5	0	0	-4	+4	0	+ I	+3
101	- I	- I	- I	+2	- I	+2	+ I	+2	-4	-2	+2	+2
102	+4	- 4	+ 3	0	+ 3	0	+ I	0	- I	0	-2	- I
103	+2	0	+ 3	-4	+ 4	-4	+2	- I	-2	0	0	-2
104	- I	+ 2	+ 2	-3	+ 2	-3	+2	- I	- I	-2	-3	0
105	-5	+ 10	- 2	0	- 2	0	+3	+ I	+ I	-2	-2	0
106	-4	+ 3	- I	0	- I	0	+2	-3	+ I	-3	-4	+ I
107	-2	- 2	- 2	- I	- 2	- I	+2	-2	+3	- I	+2	-4
108	+2	+ 3	0	-3	0	-3	-5	-4	+ I	-6	+4	- I
109	+2	+ 2	+ 3	+4	+ 3	+4	- I	+2	-2	- I	+2	+5
110	-3	+ I	+ 3	+6	+ 3	+6	+2	-3	+ I	+5	- I	+9
111	-2	+ 2	0	+ I	0	+ I	0	+6	+3	-8	0	+6
112	-5	+ 2	+ I	-7	+ I	-7	+3	-2	-4	0	+ I	+4
113	+ I	+ I	- 2	+ I	- 2	+ I	- I	+2	+3	0	+ I	+3
114	0	- I	+ I	-8	+ I	-8	0	-7	-6	-4	-2	+6
115	-3	- 2	- I	-6	- I	-6	-2	+ I	-2	+ I	- I	-2
116	-4	- 4	-13	+2	-13	+2	-2	-9	+ I	-8	+4	+3
117	-4	+ I	+ 2	+ I	+ 2	+ I	-2	- I	0	-2	-2	0
118	-3	- I	+ 3	+6	+ 3	+6	+5	-2	0	+4	- I	0
119	+3	- 4	+ I	+2	+ I	+2	0	- I	0	+2	+2	-3
120	+3	- 3	+ I	0	+ I	0	0	+ I	0	- I	0	-3
121	+ I	+ 3	+ 4	0	+ 4	0	-2	- I	0	+2	- I	+ I
122	-7	+ I	+ 2	-2	+ 2	-2	-2	+3	+2	+2	0	+3
123	-3	- 5	+ I	-2	+ I	-2	+2	-3	-2	-4	-2	-5
124	+5	+ 3	+ 2	0	+ 2	0	+2	+ I	+2	+2	+2	-4
125	+3	+ I	0	- I	0	- I	- I	+2	-2	+ I	0	0
126	-3	+ 4	- 3	+ I	- 3	+ I	-4	+2	-3	-3	0	0
127	-2	+ 4	+ 2	- I	+ 2	- I	0	-3	+3	+ I	- I	- I
128	-4	- I	+ 3	+ I	+ 3	+ I	0	-2	0	+2	0	+ I
129	+2	- 3	+ 4	- I	+ 4	0	- I	+2	+ I	- I	+ I	-2
130	+4	+ I	+ 7	-2	+ 7	-2	+5	-4	-5	- I	-2	+3
131	+ I	+ 4	- I	-5	- I	-5	- I	+ I	+ I	+ I	+ I	- I
132	- I	+ 2	- I	-4	- I	-4	+ I	- I	0	- I	0	+2
133	0	+ I	- 4	+ I	- 4	+ I	- I	+ I	- I	+2	+ I	+3

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Period.	28°3.	28°3.	sin 3D.	cos 3D.	77°8.	77°8.	29°3.	29°3.	68°7.	68°7.	39°4.	39°4.
86	-5	+1	-2	+5	-1	+3	-1	-1	-1	0	-1	+2
87	0	+1	+3	+1	0	0	-1	-1	+1	+3	+1	+3
88	+2	+1	+6	+1	+1	+6	+5	-1	+3	-3	+3	+2
89	-3	+1	-1	-3	+1	+5	+3	+2	+2	+2	-3	0
90	0	-1	0	-1	+3	-1	+5	+1	+1	+5	-2	-5
91	+1	+2	+1	-1	-2	+2	-2	-1	+3	0	-2	-2
92	+2	+4	+5	0	0	+1	0	0	-1	-1	-1	+1
93	0	+3	-1	0	+1	-3	-2	+3	+2	+3	+4	+1
94	+2	0	-3	+2	-2	+1	+1	+1	+1	+1	+1	+1
95	0	+1	-1	+1	+2	-1	+2	-1	+1	+1	0	+1
96	0	-2	0	-1	+3	+1	+1	+3	-3	-3	+4	0
97	+2	-3	-4	+2	+1	+4	-5	-1	+4	+5	-4	-5
98	+1	-4	-3	-3	-1	-3	+1	+1	0	-1	-1	+1
99	-3	+2	+2	0	+2	-2	-3	-1	-3	-2	-3	+2
100	0	-2	+1	+2	0	+2	+1	+1	0	0	-1	0
101	+1	+1	-1	+3	+2	-3	+1	-3	0	+3	-2	+2
102	+1	-2	0	+2	0	+3	-3	+1	+1	0	0	0
103	-3	0	+2	+2	+1	-2	+1	+2	+2	-1	-1	+2
104	-1	-2	+2	+2	+1	0	-1	0	-2	0	+2	+1
105	+3	-2	-3	+4	+7	0	+1	-6	+4	+2	+3	0
106	-1	+5	+2	0	+3	-1	+2	-2	-2	+2	0	+2
107	+4	0	-2	0	+3	+1	+2	+2	0	-3	0	-2
108	-3	+4	+1	-4	0	+2	-2	-1	-2	0	-1	-2
109	0	+3	0	-6	-3	0	+1	+1	-2	+2	-1	-4
110	-5	-4	-2	-1	-4	-1	+3	+4	-4	+3	+2	-4
111	0	0	0	+4	-1	0	+1	+2	-2	-2	+1	+3
112	+1	+3	0	-5	+8	0	+8	0	-2	-7	-7	0
113	-1	-2	+1	-2	-3	+1	-3	-2	-4	+1	-3	+2
114	+2	+4	-1	0	0	+2	-3	-1	-5	+4	-1	-6
115	+4	0	+4	+4	+1	-6	-1	+5	-3	-3	+3	-2
116	-2	-3	+2	+2	+5	+5	+2	-7	0	+7	-5	-3
117	+1	0	-3	0	+2	+1	+1	0	-1	-1	0	0
118	-4	+1	+5	-2	0	+1	-1	0	-2	0	0	+1
119	-3	-3	-1	-1	0	0	+1	0	+1	0	0	-1
120	+2	0	-1	0	-1	-1	+1	+1	0	0	0	0
121	-1	0	+2	+5	+3	-4	-5	+1	+4	0	+2	+3
122	-1	+5	+3	+1	-1	+2	+1	+1	0	0	0	0
123	+5	-3	+1	+3	-2	+4	0	+6	+5	+5	-7	-2
124	-5	-3	0	-2	-1	0	-1	-1	+1	-1	-2	0
125	+2	-1	+4	+1	+2	-4	+3	+3	-3	+1	0	+2
126	+3	-1	+1	-3	+1	+1	-1	0	+2	0	+1	-1
127	0	+2	+4	-1	0	-6	-6	+2	+3	+5	+1	+5
128	-2	+1	+2	-2	-3	0	-3	+3	-2	+4	-4	-1
129	-3	0	-1	+1	+1	-1	+1	0	0	0	0	-1
130	-2	+2	+4	-3	+1	-1	0	0	0	-1	-1	+1
131	0	+3	+1	-1	0	0	-1	0	+1	0	-1	-1
132	+1	0	0	0	+1	+1	0	-1	-1	0	-1	0
133	-2	+1	0	+1	0	0	0	0	+1	0	+1	0

Period.	49°5.	49°5.	69°7.	69°7.	50°5.	50°5.	49°4.	49°4.	37°3.	37°3.	50°4.	50°4.
86	+1	+5	-7	+1	+6	+2	+3	-5	-1	-6	+3	-2
87	-1	+5	-2	-5	-2	-6	-1	-2	-1	-3	+1	+2
88	-4	0	-1	+3	-5	+4	-2	-10	+9	+3	+1	-3
89	+2	+2	+3	+3	-3	+1	+2	+4	-1	-3	+1	0
90	-5	+2	-4	-3	-2	0	0	-2	-3	+2	+5	+2
91	-2	-1	+2	0	0	0	-1	0	-1	+1	-3	+3
92	-2	-1	0	+2	-1	+1	-2	-2	+1	-2	-1	-1
93	-3	+2	-1	+3	+2	-1	+2	-2	-1	+3	-1	+1
94	+1	-1	+1	0	-2	-1	-1	+3	0	-1	+6	-1
95	0	0	+1	-1	-3	-2	+2	+1	+2	0	+2	0
96	+4	0	-2	-2	-1	+1	+5	-5	+5	-4	+3	+1
97	+3	-5	-4	-3	-1	+2	-1	-1	+2	-1	-5	+1
98	0	-1	+1	0	+1	-4	-1	-2	-1	+2	-3	-4
99	+4	0	0	+4	+2	+4	+1	0	-1	-1	+4	+1
100	-1	0	+2	-1	-2	-1	-1	-1	-3	-3	-1	-3
101	-2	0	-1	+1	-1	-4	+2	-1	+1	+2	-1	-3
102	0	+1	+1	+1	0	0	-1	0	+2	0	+2	-2
103	0	-2	+2	0	+1	-1	-1	-1	-2	0	+3	-1
104	0	-2	-1	+1	-2	-1	-1	-1	-1	-3	+1	0
105	+1	-4	-4	-3	0	0	-3	-1	-3	-4	0	-3
106	-1	+1	-2	0	+1	0	0	+1	-2	+1	+4	0
107	+1	0	0	-1	-3	+1	+1	+1	-1	+1	-2	+4
108	-1	+1	+2	-1	-1	+2	-1	-1	-3	-2	-1	0
109	-6	+2	+4	+6	+2	0	-1	-2	-3	0	-2	+4
110	-2	-4	-6	+1	+2	-4	+4	-1	-2	+4	0	+3
111	-1	+1	0	0	+4	0	-2	+1	-1	-1	+1	+3
112	+4	-3	-3	+3	+2	+2	+2	0	-3	-2	+1	-4
113	+3	0	-2	-1	-1	-1	0	-4	-2	-1	+2	-1
114	-8	+1	-5	+7	+4	+4	+2	-5	+3	-3	+2	-1
115	+3	-1	+1	+2	0	-4	-1	-2	+2	0	-1	-2
116	-1	-6	+5	+1	-1	-4	+5	+6	-6	-4	-6	+1
117	0	-1	-1	+1	0	-2	+3	-3	-4	+1	-2	-4
118	+1	-1	0	0	-1	+3	-1	+1	-1	+1	-2	0
119	-2	0	-2	+1	+4	-1	-4	-3	0	-4	+3	0
120	+1	-1	+1	+2	-2	+2	0	+4	-4	-2	+1	+5
121	-3	+2	+2	-1	+1	0	-1	-2	+1	+2	-1	+2
122	+2	+1	+1	-2	-1	+2	-1	+1	+1	+2	0	-2
123	+3	+5	+2	+3	-1	-1	+4	+3	+4	+3	+4	+1
124	-2	+1	-1	-3	-1	+3	+4	-1	+1	+4	-2	+1
125	-1	0	+2	+2	-2	+3	-1	-3	0	+2	-3	+3
126	+2	+1	0	-2	0	0	-1	0	0	0	+3	0
127	-2	-4	-2	-1	-3	-2	+2	-5	-2	-7	-6	+6
128	-1	+4	-3	0	-1	-1	+1	-2	+2	-1	+1	-2
129	0	-1	+1	+1	+1	+2	+1	-2	+1	+3	0	-1
130	-1	+1	+1	0	0	-1	-2	+1	+2	0	0	-1
131	+2	0	+2	-1	-2	-2	+1	+2	+2	0	0	-2
132	+1	+1	-1	+2	-1	-1	+3	+1	+2	+1	+1	+1
133	0	-1	+1	0	-1	0	0	+1	-1	+1	-2	-1

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Period.	64°5.	64°5.	77°6.	77°6.	39°3.	39°3.	53°4.	53°4.	27°2.	27°2.	68°5.	68°5.
86	+4	+5	+6	+1	+4	+1	-3	0	-4	-4	-6	+2
87	-1	0	-1	0	0	+1	-1	-1	-1	-2	+2	0
88	+3	0	+2	+1	-2	-4	-5	+2	+2	-2	+5	0
89	+3	-3	+4	+1	-2	+2	-1	0	+1	-3	+2	+1
90	+3	0	+1	+2	-1	-6	-4	-4	-1	+2	0	-3
91	+4	+2	-2	+3	0	+4	-5	-5	+3	+2	-1	-2
92	-2	-3	+4	+1	-4	-4	-2	-3	-6	-2	-8	0
93	+1	+1	-1	-1	+1	0	-2	-2	0	+3	-2	+3
94	+5	+2	-4	-2	0	-4	+3	-1	-1	-3	+3	+3
95	+1	+1	0	-2	-1	+2	+3	+3	0	+1	+3	0
96	-1	0	+1	0	+1	-3	+1	+5	0	-2	-1	-3
97	+3	-6	-4	-4	-2	+3	-9	-1	-8	+4	-7	+2
98	+1	0	+1	0	+3	+3	-2	-2	+4	-3	+3	+4
99	+1	-2	-1	-1	+1	-6	+6	-4	-1	-5	+4	+5
100	+1	-2	+1	-2	-4	+1	0	+2	0	+4	+5	+1
101	0	+1	-1	0	+1	-2	+2	+2	+3	+2	+4	0
102	0	0	0	-1	-1	+2	+1	+1	-3	-2	-2	-5
103	-1	+1	-1	-2	-2	-2	+2	0	+3	+3	-5	-1
104	0	-1	+1	-1	+1	+4	0	+5	+3	-1	-3	+1
105	+4	-5	-2	+5	+4	-1	0	+4	-6	0	-1	+6
106	+3	+1	-2	-2	+1	+1	-1	+5	+2	+2	+3	+1
107	0	+3	+2	-2	0	0	0	+2	-2	-9	+10	-4
108	-1	0	0	+1	-1	+3	-1	+1	-7	+5	+6	-8
109	-1	-3	-2	0	+1	+1	+1	+6	+6	-2	-3	-4
110	+1	-2	-2	-1	+2	+6	-6	-5	-3	-8	-7	-4
111	+1	-3	0	+2	-2	+2	-5	+2	-1	+4	-4	+2
112	+2	+1	+3	0	-8	0	-1	+8	+2	-9	+7	+9
113	-1	+3	-2	+2	0	+1	-2	+4	-2	+5	+4	-4
114	0	0	0	-1	+2	-3	-3	-3	+8	-5	-5	-11
115	-5	+1	-2	-6	-8	+3	+4	-2	-8	-1	-10	-1
116	+5	-1	-2	+4	-4	-1	-6	-3	+9	+6	-3	+12
117	0	-2	+2	+1	-3	+1	+2	-3	-2	-7	+8	+5
118	-3	0	+4	-1	+5	-6	+7	+2	-1	+2	+5	-3
119	-2	0	+2	0	-1	+4	+3	-1	+4	-3	-3	-7
120	-3	+2	+4	+1	+1	-7	+1	0	-9	+2	-10	-2
121	-2	+1	+2	+2	-1	+5	0	+3	+4	0	-1	+6
122	+1	+3	+4	+1	-3	-4	-1	+1	-6	-5	+6	+5
123	-3	+1	-2	+3	-2	+8	-6	+3	0	+2	+4	+2
124	+2	-1	+1	-1	0	-3	-4	+3	0	-2	0	-4
125	+2	-3	+1	-2	+2	+4	-7	+1	0	0	-1	-3
126	+4	+5	-2	+6	-4	+3	+3	0	+3	+2	-1	-4
127	+3	+1	0	+3	-2	-4	+2	0	+2	+2	-1	-4
128	0	+2	-2	0	-1	+2	-3	+3	-5	-5	-7	+3
129	+2	-2	0	+4	-2	-3	-2	+2	+1	+3	+1	+3
130	0	-3	-3	+4	+1	+2	-3	0	+1	-5	+7	+1
131	0	0	0	-1	+4	-3	-6	-4	-1	+6	-2	-8
132	+1	0	0	0	-1	0	+2	-1	-2	-3	-3	+3
133	+1	0	+1	-1	0	-1	-1	-2	-3	0	-2	+3

Period.	4 ^h 3.	4 ^h 3.	55 ^h 4.	55 ^h 4.	69 ^h 5.	69 ^h 5.	28 ^h 2.	28 ^h 2.	sin 2D.	cos 2D.	29 ^h 2.	29 ^h 2.
86	- 4	- 6	+ 2	- 5	+ I	- 4	+ 3	- I	- 5	+ 3	+ I	- 4
87	0	- 3	+ 3	+ 3	0	+ 4	+ I	+ 4	- 5	+ 3	- 5	+ 3
88	- 6	- I	+ 5	+ 3	- 3	+ 4	+ 3	- 5	- 5	- 6	0	+ 3
89	- I	- 3	- I	+ I	- I	- I	+ 4	+ 2	+ 3	+ 7	+ 4	+ 6
90	- 3	- I	- 2	+ 2	0	- 2	- 5	- I	+ 3	+ 10	- 4	- 5
91	- I	0	- 2	0	+ 2	- I	0	+ 2	- I	+ 4	+ 5	+ 2
92	- 7	- 4	+ 2	- 8	- 7	+ 3	- 3	+ 5	+ 2	+ 2	- I	+ 2
93	- 4	- I	+ 3	- 3	- 4	- 3	+ 3	- 4	+ 3	+ 3	+ I	- 2
94	- 4	0	+ 3	+ 2	+ 2	0	+ 3	+ I	+ 5	- I	+ 2	+ I
95	- 4	- I	- 3	+ 5	- 2	+ 5	- 5	- I	+ 3	0	0	0
96	- 3	+ 2	- 3	+ 3	- 4	+ I	+ 3	+ 3	+ 3	+ 2	+ I	+ 2
97	+ I	+ 6	- I	+ 5	- 4	+ 2	- I	+ 2	- 3	+ 2	+ I	- 5
98	+ 4	+ 2	- 2	+ 2	- 2	- I	0	- I	0	0	+ I	+ 2
99	+ I	+ 8	- 3	- 8	+ 7	+ 4	+ 5	- 3	- I	- I	- 3	+ 2
100	+ 2	+ 6	+ 3	- 5	- 3	+ 5	- 4	- 2	- 2	- 2	- I	- 2
101	- 2	+ 3	+ 2	+ 3	0	- 3	- 2	+ 2	+ I	0	0	0
102	+ 2	+ 5	+ 2	+ 5	+ 4	- 4	+ 2	- 3	+ I	- 4	- 5	- I
103	+ 3	+ 4	- 2	+ 4	+ 3	+ 3	- I	- I	0	- 2	0	+ I
104	0	+ 3	- 2	- I	- 2	0	- I	- 2	+ 2	- 3	- I	0
105	+ 2	+ 5	- I	- 4	- I	- 4	+ I	0	+ 3	0	+ I	+ 5
106	+ 2	+ 2	0	- 3	+ 2	- 2	- 2	0	0	+ I	+ I	- I
107	+ 5	+ 10	+ 10	+ 3	- I	+ 10	- 3	+ 4	+ 2	- 2	+ I	0
108	+ 2	+ 10	- 2	+ 9	- 7	- 4	+ 4	+ I	+ I	+ 3	+ I	- I
109	+ I	+ 5	- 4	- I	+ 4	0	+ 4	+ 2	+ 4	0	+ 2	+ 2
110	0	+ 8	- 3	- 6	+ I	+ 6	- 3	- 4	+ I	- 2	+ 3	+ 5
111	0	+ 3	+ 2	- 3	- 3	0	+ 3	+ 2	+ 4	- 2	0	0
112	+ 9	+ 8	+ 9	- 8	- 7	- 8	- I	- 5	+ 5	- 4	0	+ 2
113	+ 5	0	+ 5	- I	+ 3	- 4	- 4	0	- 3	0	- I	+ 3
114	+ II	- 5	+ II	+ 6	+ II	+ 4	+ 5	+ 7	- I	- 3	- I	- 3
115	+ 9	- 6	+ I	+ II	- 4	+ 10	+ 3	- 6	+ I	0	- I	+ 3
116	+ 5	- II	- 5	+ II	- 10	+ I	- 4	+ 2	- 3	+ 6	- 9	- 2
117	0	- 10	- 9	+ 6	- 4	- 9	+ 7	- 2	+ 2	+ 2	+ I	0
118	0	- 8	- 7	- 5	+ 9	- I	- 2	- 6	- I	+ 2	0	+ 3
119	- 3	- 6	- 3	- 6	+ 4	+ 6	+ 3	+ 5	+ 2	+ 4	+ I	- 3
120	- 6	- 8	+ 5	- 7	- 7	+ 2	- I	+ I	+ 7	+ 5	+ 5	+ 3
121	- 7	- I	+ 5	- 4	- 6	- 2	- 3	+ 2	- 2	+ I	- 2	- I
122	- 8	- 2	+ 5	+ 4	+ 5	- 2	- 3	0	- 3	+ 3	+ I	0
123	- 4	- 4	- 5	+ 5	- 2	+ 7	+ 5	+ I	+ 3	+ 2	- 6	+ 3
124	- 5	+ 2	- 3	+ 6	- 3	+ 6	- 5	+ 3	+ 5	+ I	- I	- 2
125	- 4	0	- 4	- 3	- I	- 4	+ I	+ 2	- I	+ 4	- 3	- I
126	- I	+ I	- I	0	- I	0	- 2	0	+ I	+ 2	+ 3	0
127	+ 2	- 4	+ I	+ 6	- 5	- 2	+ 5	- 2	0	+ 2	0	0
128	- 4	- 7	- 2	+ 8	- 2	- 8	- 5	0	+ I	0	- 3	- 2
129	- 3	- I	- I	+ 3	+ 2	- 3	+ 2	0	+ I	+ I	+ 2	+ 3
130	- 7	- 3	- 7	- 2	+ 2	+ 6	+ 4	- 2	+ 3	+ 2	- I	- I
131	- 6	+ 7	- 9	0	0	+ 8	0	+ 4	- 4	+ I	- 4	- I
132	+ I	+ 5	- 5	- I	- 4	+ 3	+ 3	- 2	0	0	+ I	0
133	- I	+ 4	0	- 4	- 2	- 4	- 5	+ I	+ 4	- 2	0	- 2

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Period.	45°3.	45°3.	77°5.	77°5.	31°2.	31°2.	64°4.	64°4.	49°3.	49°3.	64°3.	64°3.
86	-3	+3	+5	-6	+3	+7	+2	-1	-6	0	-1	-4
87	0	-2	0	+1	-1	-1	+4	+2	+3	0	-2	-1
88	-3	+2	+1	+5	+4	-2	-3	-1	+6	-1	-2	-7
89	+2	-2	0	+3	+2	+1	+1	+2	0	+1	-1	0
90	-2	+4	0	+2	+2	+1	0	+7	+3	-3	-1	+3
91	-1	-2	0	+2	0	+2	+4	0	0	0	+1	-2
92	0	+6	-3	-2	+2	-1	+3	0	-1	0	+2	-1
93	-7	-3	-4	-3	+3	+2	-1	0	+2	+1	-1	+6
94	-2	-4	-1	+3	+2	-1	0	0	-2	-1	0	+1
95	0	+3	-2	0	0	+2	+1	+1	0	+3	-1	-2
96	-5	-4	-1	0	-1	0	+3	+4	-3	-5	+5	-2
97	0	-1	-2	-2	-1	-3	-4	-4	-2	-2	+1	+1
98	-2	+1	+2	-2	+1	+3	0	-1	-1	-2	+3	+3
99	+3	-3	+3	+1	-3	-1	+1	+2	0	+1	+1	+1
100	0	+2	-2	+2	+2	+1	0	0	-1	-2	+2	+2
101	-1	+2	-1	0	0	+2	+1	+2	-1	+2	+1	-1
102	+1	-1	-1	+1	-1	+1	0	+1	+1	-1	-1	-1
103	+3	-1	+1	-1	+1	0	-3	-1	-2	0	0	+3
104	0	+3	-3	0	+2	-4	-2	-1	-4	+1	0	-1
105	-6	-1	+4	-2	-2	+1	+1	+4	-3	+1	+2	+1
106	+1	-1	+2	-1	-1	-2	+2	0	+2	-2	+2	0
107	+1	+3	+1	+1	+2	0	+2	-2	+3	+3	-3	-1
108	0	0	0	-1	-1	-1	+2	0	-2	-4	-3	0
109	-1	+2	-2	0	-1	-2	0	+1	-3	-2	+1	-1
110	2	-3	-3	+2	-1	-4	+4	-4	-3	-5	+3	+3
111	+6	0	+1	-3	-3	+3	+2	-4	+2	+4	-3	-8
112	-1	+7	+4	-1	-3	-5	-1	0	+6	0	-2	-5
113	+1	+1	0	+3	+2	+2	0	+4	-2	-5	-2	-1
114	+2	+3	-3	-4	-3	-5	-3	+6	-2	-1	+1	-3
115	-2	-3	0	-4	+4	-1	-4	+3	-1	-1	-2	+5
116	-6	-4	-7	-1	+4	-5	+4	-2	+1	-3	-1	-8
117	-3	-1	+1	+1	0	0	+5	0	-2	+6	-8	+3
118	-1	+2	+2	+5	+4	-4	-3	+1	-1	+3	+4	-3
119	+2	-3	+1	-3	-2	-2	-3	+1	+3	-1	+5	0
120	-4	-2	+1	+3	+1	+2	+6	0	+6	-3	-1	-1
121	+2	+2	-1	+2	-2	0	+4	+2	-5	-1	-1	-3
122	+2	-3	+1	+5	-3	-5	+4	+1	+3	-1	-2	-3
123	+2	+1	+2	-1	-3	+1	-2	+1	-1	0	+5	+2
124	+3	-3	+1	+1	0	-1	-2	-2	-3	-2	+1	-3
125	-1	-1	+1	-1	-1	-1	-1	+1	+5	-2	-1	+2
126	-3	0	+1	0	+2	0	-2	+1	-1	-1	+3	-1
127	0	-1	+3	+1	0	+3	+2	-3	-2	+5	+3	+3
128	+2	-1	0	+3	-2	-2	-1	-2	0	-1	0	-3
129	0	0	+2	0	-2	-1	+1	+2	-1	0	+2	+2
130	-1	-1	-6	0	+1	+5	-1	+1	-1	+1	-3	+2
131	+4	-3	-3	0	-2	+1	+2	-2	0	-1	+1	-2
132	+2	+2	+2	+2	+1	+1	-2	0	-2	-2	-1	-2
133	+1	+1	0	0	+1	+2	+4	0	-3	+1	-1	

3 F 2

Period.	22 ^g 1.	22 ^c 1.	68 ^g 3.	68 ^c 3.	69 ^g 3.	69 ^c 3.	49 ^g 2.	49 ^c 2.	77 ^g 3.	77 ^c 3.	53 ^g 2.	53 ^c 2.
86	+3	-2	-7	-3	-5	+5	+2	-4	+3	+5	-1	0
87	-1	0	-4	0	-5	-2	-1	+2	-1	+3	-3	-2
88	+4	+3	+10	-6	-3	+12	-2	+1	-3	+6	-4	+12
89	-3	0	-2	-2	+2	+2	-4	0	+6	+4	-1	+5
90	+3	+3	+2	-1	0	0	-4	-3	-1	-2	-2	+1
91	-1	+1	0	0	-1	0	-2	+1	-4	0	+2	-4
92	-3	0	-2	+4	-2	-3	+1	+4	+5	+1	-1	-5
93	+1	-2	+1	-2	-3	+1	0	+1	-4	-2	+3	-3
94	0	+1	0	+1	+1	0	-1	0	-1	+3	+3	+1
95	-1	-1	0	-1	+1	-2	0	+2	+1	-3	+2	+6
96	+4	+2	+5	+1	-3	+2	+1	-1	-7	-1	-2	+9
97	+1	-1	0	-1	-1	+1	-7	+1	+9	+3	-1	+6
98	-5	-4	+3	-1	+4	-1	+1	0	-6	0	-3	+9
99	-1	+2	+4	+1	+2	+3	-4	-4	-4	+6	-11	-4
100	-2	-3	+1	-2	0	+1	0	-1	+6	-4	-4	-8
101	+2	0	0	-1	0	0	+1	-2	-6	-3	+4	-7
102	-2	0	+1	-3	-1	-3	-4	+2	-1	+4	+6	-3
103	-2	-2	-1	-1	+1	0	0	-2	+3	-2	+2	+1
104	-2	0	+1	0	0	-1	+3	-4	-6	-8	-4	+3
105	0	0	-1	-3	-2	+2	+3	-2	+5	+11	-7	+9
106	+3	-3	+1	+5	+2	+4	+1	-6	+3	-7	-8	-1
107	+2	-2	-1	-1	0	0	-7	-1	-8	-2	-3	-8
108	-1	-2	-4	0	+3	0	+2	-1	+3	+6	+7	-10
109	+1	-3	-1	+2	+4	+3	-2	+1	+5	-17	+12	-2
110	-2	+4	-4	0	-4	+2	-10	+1	-10	+4	+13	+1
111	+2	+1	+3	+4	-3	+2	-1	0	+8	-10	+10	+2
112	+7	-4	-3	-1	-1	+2	+4	-1	-10	-3	-2	+15
113*	-2	0	-2	-1	-1	+3	+2	-2	+1	+11	-9	+11
114	-2	+2	0	-3	0	-2	-1	+6	+5	-17	-24	+4
115	-2	+3	0	-1	+2	+2	+3	+2	-15	+6	-16	-8
116	+1	+7	+1	-3	+2	+4	0	+5	+13	+10	-4	-17
117	-7	+1	-6	+1	+4	+6	-2	-5	+6	-13	+7	-17
118	-2	-5	-3	-2	-3	-2	-4	-6	-2	+7	+8	-6
119	-2	+4	0	-1	0	0	0	+2	+4	-2	+3	0
120	+3	0	+4	-1	-2	0	0	+4	-7	-4	+6	+8
121	+4	+1	-4	+2	+3	+4	0	+4	+5	+7	+3	+10
122	-1	0	+1	+6	0	+5	+4	+7	+2	-5	-6	+9
123	-2	+1	+3	-2	-1	+1	+10	+4	-4	-4	-10	-5
124	-1	-1	-2	-3	-1	+2	+2	+1	+5	+6	-2	-5
125	0	+2	+2	+2	+3	+2	+6	-4	-1	-6	+3	-6
126	-3	+2	0	-2	+2	0	+1	0	-2	+4	+2	-3
127	+4	-1	-3	-1	+1	-3	-1	+2	0	+5	+1	+3
128	-4	+2	+3	-5	-5	+1	0	-2	+4	-8	-7	+9
129	+2	-1	-4	0	-1	+4	-2	-1	-7	+4	-8	+2
130	+5	+1	0	+3	-1	+1	-1	-3	+10	-3	-10	+4
131	+1	-2	-2	+1	-1	-1	-1	+4	-9	-7	-14	-3
132	-1	-1	+2	0	-1	-1	-1	+2	+5	+6	-7	-4
133	+2	0	+1	-1	-1	-1	+1	-1	+2	-3	-2	-5

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Period.	27°I.	27°I.	sin D.	cos D.	31°I.	31°I.	64°2.	64°2.	68°2.	68°2.	69°2.	69°2.
86	- 4	+ 4	+ 8	- 12	- 8	+ 2	+ 5	- 4	+ 3	+ 3	- 3	- 6
87	- 2	- 4	+ 3	- 7	- 5	- 3	- 4	+ 3	+ 1	+ 3	+ 5	0
88	+ 1	- 12	- 2	- 7	+ 2	+ 1	- 3	- 2	+ 4	+ 2	+ 2	- 2
89	+ 4	- 4	- 8	- 6	- 4	+ 4	+ 4	0	- 1	- 2	0	- 3
90	+ 1	- 1	- 5	- 5	- 4	+ 2	- 4	+ 1	+ 4	+ 2	- 1	+ 4
91	+ 3	+ 3	- 1	- 4	0	- 2	+ 1	+ 1	- 1	+ 2	0	- 3
92	+ 1	+ 6	- 4	- 1	+ 3	- 2	+ 1	- 4	+ 1	+ 1	+ 1	- 2
93	- 2	- 2	- 6	- 3	+ 2	- 1	+ 1	+ 4	+ 2	0	- 1	- 2
94	+ 1	+ 2	- 3	0	- 1	- 4	- 6	+ 1	0	0	- 1	- 1
95	- 5	- 6	- 4	+ 2	- 1	+ 1	- 2	- 1	- 2	+ 1	- 3	- 1
96	+ 9	- 2	- 3	+ 1	- 4	+ 1	+ 1	- 1	0	- 3	+ 3	0
97	+ 2	+ 4	0	0	0	+ 2	- 2	+ 2	+ 2	+ 3	- 2	- 1
98	- 7	- 4	+ 4	- 2	- 1	0	+ 1	- 1	- 6	- 1	+ 3	+ 5
99	+ 9	+ 5	- 3	0	- 4	- 2	+ 1	+ 3	+ 1	+ 4	+ 4	- 1
100	- 8	0	- 1	+ 2	- 1	- 3	+ 2	- 2	- 2	+ 2	- 1	+ 3
101	+ 6	- 3	0	+ 2	- 2	+ 1	+ 3	+ 1	+ 2	+ 1	0	+ 2
102	0	+ 7	- 3	+ 6	+ 2	- 2	0	- 2	- 1	0	0	0
103	- 1	- 2	- 1	- 3	0	0	- 1	+ 2	- 2	0	+ 1	- 1
104	- 2	- 1	- 2	- 8	+ 5	- 1	0	- 1	- 2	+ 5	+ 5	- 2
105	- 5	- 1	- 2	- 14	- 1	- 3	0	0	+ 3	- 4	- 1	- 4
106	+ 5	+ 3	- 1	- 11	- 1	- 2	0	+ 1	+ 1	+ 3	+ 1	+ 3
107	- 8	+ 3	- 2	- 9	+ 3	0	+ 1	0	- 3	- 1	- 2	- 3
108	+ 8	- 8	- 2	- 9	0	+ 3	+ 1	0	+ 2	+ 3	- 2	+ 1
109	- 3	+ 10	0	- 10	- 1	+ 4	0	+ 3	+ 3	+ 1	- 2	0
110	- 7	- 4	+ 3	- 9	+ 5	+ 1	0	+ 4	+ 2	+ 1	0	- 2
111	+ 5	0	- 2	- 11	+ 6	- 6	- 7	0	+ 5	+ 3	+ 6	- 3
112	- 17	+ 3	- 2	- 11	- 2	- 1	- 3	- 1	+ 1	- 2	+ 2	- 1
113	+ 3	- 12	- 3	- 3	+ 1	+ 7	- 7	- 2	+ 5	0	+ 4	+ 5
114	+ 3	+ 20	- 1	- 4	+ 7	- 2	- 2	- 5	+ 4	+ 4	- 5	0
115	- 10	- 7	- 4	- 6	+ 1	- 2	+ 1	0	- 2	- 2	+ 2	+ 4
116	+ 14	+ 1	- 2	- 1	+ 2	- 2	- 3	+ 1	0	+ 3	+ 3	- 2
117	- 6	+ 14	+ 3	+ 8	- 2	+ 3	- 2	- 1	- 2	+ 7	+ 4	+ 4
118	- 1	- 8	- 3	+ 6	0	+ 1	+ 1	0	- 4	- 3	- 4	- 4
119	0	+ 1	- 1	+ 3	- 2	- 4	- 2	- 1	+ 5	- 1	+ 3	+ 4
120	- 6	- 3	- 5	- 2	+ 6	- 2	+ 4	+ 4	- 4	- 1	+ 4	- 4
121	+ 7	- 6	- 3	+ 1	- 2	- 3	0	+ 4	- 1	+ 1	+ 2	- 2
122	- 1	+ 9	+ 1	+ 6	- 4	- 7	0	- 5	- 4	- 1	- 1	+ 4
123	+ 1	- 11	- 7	0	- 5	+ 5	+ 1	- 4	- 1	+ 2	0	+ 3
124	- 1	- 1	- 8	+ 6	- 4	+ 8	+ 4	+ 6	Q	+ 4	- 2	+ 3
125	0	- 3	- 5	- 4	- 2	- 4	+ 4	0	0	- 3	+ 2	0
126	+ 2	- 2	+ 1	+ 1	- 1	+ 2	+ 2	- 1	- 1	0	+ 2	0
127	- 1	+ 3	- 6	+ 6	- 1	- 1	+ 1	0	+ 6	+ 2	- 6	- 4
128	+ 8	+ 2	- 3	+ 5	+ 1	- 3	+ 1	+ 3	- 3	- 4	- 4	+ 4
129	- 2	+ 6	- 6	- 3	+ 2	- 1	+ 1	- 1	- 1	- 4	- 3	- 2
130	- 4	- 5	- 2	- 4	- 1	+ 5	- 3	- 1	+ 2	+ 2	+ 1	+ 2
131	+ 11	0	+ 6	- 2	- 2	- 1	+ 1	+ 1	- 2	- 1	+ 1	- 2
132	- 1	+ 5	+ 1	+ 2	- 1	- 2	- 4	+ 1	+ 2	+ 5	- 3	- 5
133	- 3	- 5	- 5	+ 3	+ 3	0	- 2	0	- 1	0	+ 1	- 1

Period.	$37^{\circ}1.$	$37^{\circ}1.$	$77^{\circ}2.$	$77^{\circ}2.$	sin F.	cos F.	$2.2 \cos D$ + 1°1.	No. of Observations.
86	-7	+ 4	-7	-1	+ 4	+ 6	-11	118
87	-1	- 7	+5	+4	+ 6	+ 7	- 5	134
88	-1	+10	+3	+8	- 4	- 5	+ 3	123
89	+1	+ 3	-2	+2	- 2	+ 5	-10	121
90	+2	0	-1	0	+ 1	+ 4	-14	126
91	-1	- 2	+1	-1	+ 5	+ 2	- 7	130
92	-5	+ 2	+5	-2	- 1	+ 3	0	128
93	-1	- 1	-4	-2	0	+ 3	- 5	109
94	+2	0	-1	0	+ 2	+ 3	+ 1	109
95	+2	- 3	+1	-4	+ 2	+ 1	+ 1	138
96	0	+ 3	-3	0	- 1	- 1	- 4	140
97	+2	- 2	-3	-1	- 3	+ 5	- 2	135
98	+2	- 1	+2	+3	- 6	+11	+ 1	119
99	+1	- 3	+1	+5	- 7	+ 2	+ 1	111
100	+1	0	+1	-2	- 5	+ 3	+ 1	123
101	+1	+ 2	-1	+1	- 3	+ 3	- 3	125
102	-1	- 1	0	+1	- 3	+ 5	+ 6	124
103	+3	- 2	+3	-1	+ 2	+ 8	0	108
104	+1	0	+2	-1	+ 5	+ 6	0	128
105	+7	- 3	+8	+1	- 2	0	- 6	116
106	0	- 1	+2	0	+ 2	+ 3	- 4	121
107	+3	- 1	-2	-3	+ 3	+ 3	+ 1	116
108	-1	+ 3	-1	+1	+ 7	0	- 2	123
109	+2	+ 2	-1	-1	+ 7	0	+ 1	114
110	+2	+ 4	-1	+3	+ 1	0	+ 2	125
111	-2	- 3	-3	+2	- 4	+ 5	- 4	96
112	-1	+ 3	0	0	+ 2	- 1	+ 6	104
113	-2	+ 4	+2	-1	0	0	+ 3	115
114	0	- 3	+2	-3	- 3	- 9	+ 2	93
115	+8	- 1	+3	+4	- 4	- 3	- 5	115
116	-5	+ 3	+3	+1	- 1	- 1	-11	115
117	0	- 6	+2	-7	- 4	- 1	0	113
118	+2	+ 2	-3	-4	- 3	- 3	+ 1	117
119	-3	- 4	-5	-1	+ 1	+ 3	- 3	114
120	-2	+ 2	-1	+1	- 2	- 4	- 7	100
121	+3	+ 7	+4	-3	- 5	- 5	- 6	120
122	+1	- 2	+1	+3	- 5	- 2	- 1	84
123	-2	+ 1	+1	0	+ 1	- 4	- 5	91
124	-4	- 1	-5	-3	+ 2	0	+ 1	114
125	-1	+ 2	+1	-2	+ 2	- 1	- 7	90
126	-1	+ 5	+2	+3	+ 1	+ 2	- 1	134
127	-2	+ 1	-2	-1	+ 5	+ 3	+ 1	120
128	-2	+ 4	0	-1	+12	- 1	+ 3	127
129	+2	- 3	+4	0	+ 9	0	- 5	128
130	+2	+ 4	-1	-3	+ 3	- 6	- 1	112
131	0	0	-1	0	0	- 9	- 1	123
132	+4	- 4	0	+2	- 2	- 1	+ 1	133
133	-3	- 2	-3	+2	0	+ 1	+ 2	124

TABLE VII.

Comparison for Solar Terms in Moon's Latitude of Observed with Theoretical Coefficients.

Ref. No.	Argument.	Coefficient of Hansen's Tables. Sine.	Apparent Correction.		Concluded Coefficient.	Brown's Coefficient. M.N. lxv. pp. 286-291.	Argument.	
			Sine.	Cosine.			g. g'. F. D.	g. g'. w. w'.
8	0 0 1 4	+ 1.19	- 0.11	- 0.03	+ 1.1	+ 1.19	5-4	5-4
29	0 0 1 2	+ 117.24	+ 0.04	+ 0.03	+ 117.3	+ 117.26	3-2	3-2
50	0 0 1 1	- 5.41	+ 0.17	+ 0.40	- 5.4	- 5.36	2-1	2-1
70	0 0 1 0	+ 18461.65	- 0.27	- 0.72	+ 18461.3	(+ 18461.48)	1 0 1 0	
91	0 0 1-1	+ 4.91	+ 0.09	+ 0.33	+ 4.9	+ 4.80	0 1 0 1	
79	0 0-1 2	+ 623.71	- 0.05	+ 0.05	+ 623.7	+ 623.66	1-2	1-2
58	0 0-1 3	- 0.35	+ 0.05	0.00	- 0.3	- 0.35	2-3	2-3
37	0 0-1 4	+ 3.68	- 0.06	- 0.07	+ 3.6	+ 3.68	3-4	3-4
2	1 0 1 4	+ 0.21	- 0.10	+ 0.04	+ 0.2	+ 0.21	6-4	5-4
14	1 0 1 2	+ 15.12	+ 0.01	- 0.01	+ 15.1	+ 15.12	4-2	3-2
27	1 0 1 1	- 0.67	- 0.09	- 0.02	- 0.7	- 0.67	3-1	2-1
47	1 0 1 0	+ 10.0101	+ 0.17	- 0.03	+ 10.02	+ 81.0101	2 0 1 0	
67	1 0 1-1	+ 0.47	- 0.16	- 0.05	+ 0.4	+ 0.43	1 1 0 1	
88	1 0 1-2	- 166.58	- 0.03	+ 0.04	- 166.6	- 166.58	0 2-1 2	
80	- 1 0-1 3	- 0.30	- 0.10	- 0.05	- 0.3	- 0.31	1-3	2-3
61	- 1 0-1 4	+ 6.58	- 0.05	+ 0.07	+ 6.6	+ 6.58	2-4	3-4
20	- 1 0-1 6	+ 0.09	+ 0.03	+ 0.01	+ 0.1	+ 0.10	4-6	5-6
17	- 1 0 1 4	+ 3.00	- 0.08	+ 0.05	+ 2.9	+ 3.00	4-4	5-4
31	- 1 0 1 3	- 0.21	+ 0.05	+ 0.04	- 0.2	- 0.21	3-3	4-3
53	- 1 0 1 2	+ 199.46	+ 0.04	- 0.01	+ 199.5	+ 199.49	2-2	3-2
73	- 1 0 1 1	+ 0.12	- 0.04	- 0.05	+ 0.1	+ 0.14	1-1	2-1
94	- 1 0 1 0	- 999.53	- 0.19	0.00	- 999.7	- 999.70	0 0 1 0	
76	1 0-1 1	- 1.61	+ 0.05	- 0.04	- 0.6	- 0.59	1-1	0-1
55	1 0-1 2	+ 33.37	- 0.01	0.00	+ 33.4	+ 33.36	2-2	1-2
18	1 0-1 4	+ 0.47	0.00	0.00	+ 0.5	+ 0.48	4-4	3-4
26	0 1 1 2	- 1.28	- 0.11	+ 0.07	- 1.4	- 1.27	3-1	3-2
46	0 1 1 1	+ 0.81	+ 0.11	+ 0.01	+ 0.9	+ 0.80	2 0 2-1	
66	0 1 1 0	- 6.48	- 0.06	- 0.08	- 6.5	- 6.49	1 1 1 0	
81	0-1-1 2	+ 29.73	0.00	+ 0.02	+ 29.7	+ 29.69	1-3	1-2
39	0-1-1 4	+ 0.41	+ 0.06	0.00	+ 0.5	+ 0.42	3-5	3-4
9	0-1 1 4	+ 0.16	- 0.02	0.00	+ 0.1	+ 0.15	5-5	5-4
32	0-1 1 2	+ 7.99	+ 0.05	- 0.01	+ 8.0	+ 8.00	3-3	3-2
74	0-1 1 0	+ 4.87	+ 0.01	+ 0.04	+ 4.8	+ 4.86	1-1	1 0
96	0-1 1-1	- 0.80	- 0.15	- 0.14	- 0.9	- 0.81	0 0 0 1	
75	0 1-1 2	- 12.14	+ 0.12	+ 0.15	- 12.1	- 12.14	1-1	1-2
33	0 1-1 4	- 0.10	- 0.09	+ 0.01	- 0.1	- 0.11	3-3	3-4
5	0 0 3 2	- 0.14	+ 0.10	+ 0.07	- 0.1	- 0.14	5-2	5-2
23	0 0 3 0	- 6.30	+ 0.06	- 0.01	- 6.2	- 6.30	3 0 3 0	
64	0 0 3-2	- 2.15	- 0.04	- 0.04	- 2.2	- 2.19	1 2 1 2	

Ref. No.	Argument.	Coefficient of Hansen's Tables. Sine.	Apparent Correction.		Concluded Coefficient.	Brown's Coefficient. M.N. lxv. pp. 286-291.	Argument.
			Sine.	Cosine.			
6	2 0 1 2	+ 1.52	- 0.03	+ 0.04	+ 1.5	+ 1.52	5 - 2 3 - 2
25	2 0 1 0	+ 61.89	- 0.05	- 0.05	+ 61.9	+ 61.91	3 0 1 0
43	2 0 1 - 1	+ 0.11	+ 0.07	+ 0.01	+ 0.1	+ 0.11	2 1 0 1
65	2 0 1 - 2	- 15.57	- 0.01	- 0.09	- 15.6	- 15.57	1 2 - 1 2
82	- 2 0 - 1 4	+ 0.64	+ 0.03	- 0.01	+ 0.7	+ 0.64	1 - 4 3 - 4
35	- 2 0 1 4	+ 2.42	+ 0.03	- 0.05	+ 2.4	+ 2.41	3 - 4 5 - 4
78	- 2 0 1 2	- 1.62	+ 0.02	+ 0.01	- 1.6	- 1.62	1 - 2 3 - 2
72	2 0 - 1 0	+ 31.76	- 0.09	- 0.01	+ 31.7	+ 31.76	1 0 - 1 0
30	2 0 - 1 2	+ 2.15	- 0.01	+ 0.02	+ 2.1	+ 2.15	3 - 2 1 - 2
12	1 1 1 2	- 0.26	+ 0.05	+ 0.02	- 0.2	- 0.24	4 - 1 3 - 2
24	1 1 1 1	+ 0.10	- 0.05	- 0.02	+ 0.1	+ 0.10	3 0 2 - 1
42	1 1 1 0	- 5.33	+ 0.02	- 0.01	- 5.3	- 5.33	2 1 1 0
85	1 1 1 - 2	- 7.47	0.00	- 0.08	- 7.5	- 7.46	0 3 - 1 2
62	- 1 - 1 - 1 4	+ 0.52	+ 0.10	+ 0.03	+ 0.6	+ 0.60	2 - 5 3 - 4
19	- 1 - 1 1 4	+ 0.35	0.00	- 0.02	+ 0.3	+ 0.34	4 - 5 5 - 4
56	- 1 - 1 1 2	+ 8.91	- 0.06	+ 0.01	+ 8.9	+ 8.90	2 - 3 3 - 2
93	1 1 - 1 0	- 5.10	- 0.02	- 0.07	- 5.1	- 5.10	0 1 - 1 0
52	1 1 - 1 2	- 0.83	- 0.05	+ 0.09	- 0.9	- 0.83	2 - 1 1 - 2
16	1 - 1 1 2	+ 1.16	- 0.02	0.00	+ 1.1	+ 1.14	4 - 3 3 - 2
51	1 - 1 1 0	+ 6.76	+ 0.02	+ 0.09	+ 6.8	+ 6.76	2 - 1 1 0
92	1 - 1 1 - 2	+ 0.80	+ 0.01	- 0.02	+ 0.8	+ 0.80	0 1 - 1 2
57	- 1 1 - 1 4	- 0.15	+ 0.01	- 0.05	- 0.1	- 0.17	2 - 3 3 - 4
49	- 1 1 1 2	- 1.32	+ 0.03	+ 0.07	- 1.3	- 1.32	2 - 1 3 - 2
90	- 1 1 1 0	- 5.66	+ 0.04	+ 0.04	- 5.6	- 5.66	0 1 1 0
59	1 - 1 - 1 2	+ 1.78	+ 0.05	- 0.02	+ 1.8	+ 1.77	2 - 3 1 - 2
83	0 - 2 - 1 2	+ 1.10	- 0.02	+ 0.05	+ 1.1	+ 1.10	1 - 4 1 - 2
36	0 - 2 1 2	+ 0.39	- 0.04	- 0.02	+ 0.4	+ 0.39	3 - 4 3 - 2
71	0 2 - 1 2	- 0.13	- 0.08	- 0.12	- 0.2	- 0.14	1 0 1 - 2
10	1 0 3 0	- 1.02	- 0.04	+ 0.01	- 1.0	- 1.02	4 0 3 0
40	1 0 3 - 2	- 0.33	+ 0.04	- 0.03	- 0.3	- 0.33	2 2 1 2
13	- 1 0 3 2	- 0.25	+ 0.01	- 0.09	- 0.2	- 0.24	4 - 2 5 - 2
44	- 1 0 3 0	- 2.79	0.00	+ 0.01	- 2.8	- 2.81	2 0 3 0
86	- 1 0 3 - 2	+ 0.29	0.00	- 0.03	+ 0.3	+ 0.29	0 2 1 2
1	3 0 1 2	+ 0.14	- 0.05	+ 0.04	+ 0.1	+ 0.14	6 - 2 3 - 2
11	3 0 1 0	+ 3.98	- 0.03	- 0.05	+ 4.0	+ 3.98	4 0 1 0
41	3 0 1 - 2	- 1.52	+ 0.01	- 0.02	- 1.5	- 1.52	2 2 - 1 2
89	3 0 - 1 - 2	- 0.27	- 0.04	+ 0.01	- 0.3	- 0.26	0 2 - 3 2
48	3 0 - 1 0	+ 1.59	- 0.02	- 0.06	+ 1.6	+ 1.59	2 0 - 1 0
15	3 0 - 1 2	+ 0.15	- 0.06	- 0.04	+ 0.1	+ 0.15	4 - 2 1 - 2

Ref. No.	Argument.	Coefficient of Hansen's Tables. Sine.	Apparent Correction.		Concluded Coefficient. M.N. lxv. pp. 286-291.	Brown's Coefficient. M.N. lxv. pp. 286-291.	Argument. g. g'. w. w'.
			Sine.	Cosine.			
22	2 I I 0	-0.64	-0.01	-0.01	-0.6	-0.64	3 I I 0
63	2 I I -2	-0.66	-0.01	+0.02	-0.7	-0.66	I 3-I 2
38	-2-I I 4	+0.22	-0.04	+0.03	+0.2	+0.22	3-5 5-4
68	2 I-I 0	-0.31	-0.06	+0.05	-0.4	-0.31	I I -I 0
7	2-I I 2	+0.13	0.00	-0.02	+0.1	+0.11	5-3 3-2
28	2-I I 0	+0.80	-0.09	-0.0	+0.7	+0.81	3-I I 0
77	2-I-I 0	+0.32	-0.01	+0.02	+0.3	+0.30	I-I-I 0
34	2-I-I 2	+0.12	+0.09	+0.0	+0.2	+0.13	3-3 I-2
84	I 2 I -2	-0.28	+0.03	+0.02	-0.3	-0.27	0 4-I 2
60	-I -2 I 2	+0.32	+0.03	+0.0	+0.3	+0.32	2-4 3-2
54	I -2 I 0	+0.14	-0.13	0.00	0.0	+0.12	2-2 I 0
95	-I 2-I 2	-0.10	-0.01	-0.0	-0.1	-0.11	0 0 I-2
45	-I 2 I 2	-0.12	+0.03	+0.05	-0.1	-0.12	2 0 3-2
87	-I 2 I 0	-0.11	-0.05	0.00	-0.1	-0.10	0 2 I 0
3	2 0 3 0	-0.12	-0.05	+0.01	-0.2	-0.12	5 0 3 0
69	-2 0 3 0	+0.11	+0.07	-0.01	+0.2	+0.13	I 0 3 0
4	4 0 I 0	+0.26	0.00	-0.03	+0.3	+0.27	5 0 I 0
21	4 0 I -2	-0.13	0.00	0.00	-0.1	-0.14	3 2-I 2

TABLE VIII.
Comparison for Figure of Earth Terms in Moon's Latitude of Observed
with Theoretical Coefficients.

Ref. No.	Argument.	Coefficient of Hansen's Tables. Sine. Cosine.		Apparent Correction. Sine. Cosine.		Hill's Coefficient.
		Sine.	Cosine.	Sine.	Cosine.	
97	$g + F - (-\vartheta)$	-0.48	...	0.00	-0.08	-0.45
98	$F + (-\vartheta)$	-0.35	...	+0.05	+0.06	-0.35
99	$F - (-\vartheta)$	-8.26	+1.66	+0.13	-0.13	-8.73
100	$2D - F + (-\vartheta)$	...	...	+0.04	-0.03	-0.32
101	$-g + F - (-\vartheta)$	+0.48	...	+0.03	-0.13	+0.49

fluctuation of the mean error, such as may be introduced by change of refraction, instrumental errors, &c. Multiplication by $2\cdot2 \cos D + 1\cdot1$ instead of by $\cos D$ eliminates these fluctuations, and retains any periodicity in the coefficient of $\cos D$ such as may arise from a term of the form $g - g' + \omega$, for example. For this reason also it was necessary to investigate the coefficient of $\sin(g - g' + \omega)$ with D as the auxiliary angle.

D is, for numerical purposes, taken as ${}_{57}A_2$, or an angle which goes through two revolutions in fifty-seven lunar days. Its epoch is, however, adjusted every period, so as to keep $D=0$ corresponding to new moon. Every other auxiliary angle has its

mean motion expressed by its notation. Its epoch is such that it passes through the value zero at day 0 or day $0\frac{1}{2}$, according as its first suffix is not, or is, divisible by 4. Day 0 is mean lunar noon (about 9^h G.M.T.) on 1750 September 12.

From columns 53^s_2 , 53^e_2 of Table VI., by a formula suggested by line 70 of Table I., two columns were formed which would approximately represent the mean product of each period of every error by $2 \sin F$, $2 \cos F$ respectively. Before setting these columns down at the end of Table VI., each quantity in column "sin F" was increased by $3(0''30)$ in order to bring the mean to approximately zero. Each quantity in column "cos F" (periods 86 to 117) was corrected for Newcomb's corrections multiplied by the ratio of the principal inequality in latitude to the radius. Each quantity was then further increased by $+0''5$ to make the mean approximately zero, showing that the tabular values of F used during the last fifty years, and corrected before 1883 from Newcomb's corrections, have in the mean been $5''5$ greater than the observed. This indicates a correction of about $+5''$ to the position of the node, the question of the observed motion of the node being deferred for the present.

These two columns, "sin F" and "cos F," were those used for arguments $F \pm \varpi$ in the figure of Earth terms.

Turning now to Table VIII., it will be seen that Dr. Hill has given too large a coefficient to the principal figure of Earth terms. I am unable also to trace the existence in Hansen's tables of a term with coefficient exceeding $0''1$ with argument $2D - F - \varpi$. This is very probably an algebraical error of my own; but it is at any rate quite certain that any coefficient that is employed by Hansen's tables is not in need of serious correction. I have failed, therefore, to verify the term of Dr. Hill's

$$-0''32 \sin(2D - F - \varpi)$$

I wish to call attention to the term with argument ω (Ref. No. 94, Table VII.). The period of this term is about six years, and the correction to Hansen's tabular coefficient obtained from the observations is confirmed by Professor Brown's theory. I argue from this that the large corrections obtained to the principal figure of Earth terms both in longitude and latitude are real, and are far larger than can fairly be ascribed to change of observers or other observing errors.

Lastly, as to the accuracy of the arithmetic, it will be seen that Table VI. contains two auxiliary angles, $_{27}A_3$ and $_{45}A_5$, which are identically equal. The process of formation of the columns 27^s_3 , 27^e_3 , however, was entirely independent of the formation of columns 45^s_5 , 45^e_5 , and it will be seen that the two pairs of columns mutually confirm one another. This agreement, however, was only obtained after the detection of 4 errors in the 192 numbers, consisting of 5, 2, 1, and 1 units respectively. The sum of these errors added without regard to sign and

divided by 192 is $0''\cdot005$, a negligible quantity. Although, therefore, the other columns of Table VI. have not been subjected to so searching a test, I believe the results as given in Tables VII. and VIII. may be relied on to within the accidental errors due to the observations.

On the Discordant Values of the Principal Elliptic Coefficient in the Moon's Longitude. By P. H. Cowell.

The values given for the coefficient of the principal elliptic term in the Moon's longitude have varied from $22637''\cdot15$ of Hansen's theory to $22641''\cdot6$ of Airy's tabular places. In the present note I take some of the values published during the last half-century, and I try as far as possible to trace the discordances to their source. The values in question are—

Ref. No.	Author.	Coefficient.	Material.	Reference.
1	Airy	$22639''\cdot06$	Greenwich 1750-1851	<i>Memoirs R.A.S.</i> xxix. p. 13.
2	Newcomb	$\cdot82$	„ 1847-1858	Corrections to Hansen's Tables, p. 29.
3	„	$\cdot50$	Greenwich and Washington 1862-1874	„ „
4	Nevill	$\cdot32$	Greenwich 1862-1877	<i>Memoirs R.A.S.</i> xlviii. p. 417.
5	Cowell	$\cdot54$	„ 1750-1851	<i>Monthly Notices</i> , vol. lxv. p. 147.
6	„	$\cdot46$	„ 1847-1901	„ „

I shall establish the propriety of the following corrections to the above values :

Ref. No.	Solar Correction.	Planetary Corrections.	Corrected Value.
1	$+0''\cdot16$	„	$22639''\cdot22$
2	$-0\cdot25$	$+0\cdot06$	$\cdot63$
3	$-0\cdot25$	$+0\cdot10$	$\cdot35$
4	$+0\cdot05$	$+0\cdot06$	$\cdot43$
5	...	...	$\cdot54$
6	...	...	$\cdot46$

It will be seen that the accordance of the six values is improved by these corrections. The range is reduced from $0''\cdot76$ to $0''\cdot41$, or, leaving out Airy's result, from $0''\cdot50$ to $0''\cdot28$.

One of my values (Ref. No. 5) is based upon the same observed places as Airy's, and the discordance is not therefore due to errors of observation. Either Airy's analysis or mine is wrong.